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THE ROSS XPRES LENS

These lenses are the finest examples of modern most ultra rapid lenses. Cinematograph, Reflex, Focal Plane and Press Photographers will find them invaluable. A distinctive feature of F, 3.5 lens is its wide angle of view.

PRICES ROSS XPRES LENS, f/1.9 B J. P.A.

| Equi Foct | | - Plate Covered | Flange Size | In Iris Setting | Code Word Iris Setting | Flange Size | In Focussing Jacket | Code Word Focussing Mounts |
|----------------|--------------|---------------------------|----------------|-----------------------------|---------------------------------|----------------|-----------------------------|-------------------------------------|
| mm. 25 | in. | mm. 16×12 in. | in. 1½ | f s. d. | Yeda | in. 1% | f s. d. | Yedafo |
| 38 50 75 | 1½ 2 3 | 1 × 3 1 × 3 25 × 13 | 11 12 2 | 10 10 0 11 0 0 13 0 0 | Yefe Yegi Yeho | 1½ 1% 2½ | 12 0 0 12 15 0 15 0 0 | Yefefo Yegifo Yehofo |

ROSS XPRES LENS, 62.9

| | ROSS X | PRES LENS | , j ₂ .9 | | |
|--|--|---|--|--|---|
| Equiv. Focus | | | Code Word Iris Setting | Price in Focussing Mounts | Code Word Focussing Mounts |
| mm. in. 25 1 50 2 62 2½ 75 3 144 55 165 6½ 215 8½ 254 10 | in. 16×12 mm. 1×2 1×2 1×2 23×14 33×25 & 44×31 44×36 & 5 × 4 5 × 4 & 65×4 65×42 | £ s. d. 8 10 0 9 0 0 9 15 0 10 10 0 15 10 0 17 10 0 25 0 0 35 0 0 | Zuabo Zuace Zuadi Zuafo Zubal Zucem Zudin Zufop | £ s. d. 10 10 0 11 5 0 12 0 0 18 0 0 21 0 0 | Zuaec Zuaid Zuaof Zubla Zucme |

ROSS YPRES LENS 1/3 5

| | RC | SS XPRES L | ENS, f/3.5 | | |
|---|---|--|---|--|---|
| Equiv. Focus | Plate Covered | Price in Iris or Sunk Setting | Code Word Iris Setting | Price in Focussing Mounts | Code Word Focussing Mounts |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | in. 1 × 1 1 1 × 1 1 1 × 1 1 1 × 1 1 1 1 × 1 | f. s. d. 610 0 610 0 710 0 8 0 0 10 0 0 1110 0 1215 0 14 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | Zabse Zenar Zecuno Zecupa Zedan Zefep Zegir Zehos Zejut Zekav Zelew | £ s. d. 7 12 6 7 12 6 8 12 6 9 10 0 11 0 0 12 5 0 13 15 0 15 5 0 | Zebune Zecto Zoton Zotup Zedna Zefpe Zegsi Zehfto |

In sunk settings for Reflex Cameras at same price as ordinary mounts. The Special Focussing Mounts are for Hand Cameras of fixed extension. These special mounts do not admit of between-lens Shutters.

Cost of pairing lenses for Stereoscopic work, 15/-.

ROSS LTD.

CLAPHAM COMMON

LONDON, S.W.4



THE ROSS XPRES LENS

The Ross Xpres F 4.5 lens combines extreme speed with a quality of definition unequalled in lenses of the same aperture. Its critical definition at full aperture is maintained over the whole of the plate. Faults usually associated with similar lenses such as Ghost, Flare and Coma are totally absent.

PRICES
ROSS XPRES LENS, f/4.5

| | | 110 | DO III | | 13.1 | Code |
|---|---|------------------|--|---|---|---|
| Equi Focu | v. is | Plate Covered | Price in Iris or Sunk Setting | Code Word Iris Setting | Price in Focussing Mounts | Word Focussing Mounts |
| mm. 75 90 105 112 120 127 136 140 152 165 184 215 254 305 360 420 533 | in. 3 3 1 1 1 2 4 4 5 5 5 6 6 1 1 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | ** | S. d. 6 5 0 7 0 0 7 0 0 7 0 0 7 10 0 7 10 0 7 10 0 8 10 10 10 0 0 11 0 0 14 10 10 29 0 0 40 0 0 75 0 0 | Xasal Xama Xamaf Xapel Xalas Xaqes Xeros Ximes Xopos Xugus Xares Xesis Xitos Xusic Xovus Xuras | \$ 15 0 8 15 0 8 15 0 9 10 0 9 10 0 10 15 0 12 5 0 13 10 0 | Xeptre Xartra Xestree Xemtred Xintrop Xoptemp Xuqtrowp |

In sunk settings for Reflex Cameras at same price as ordinary mounts. The Special Focussing Mounts are for Hand Cameras of fixed extension. These special mounts do not admit of between-lens Shutters. Cost of pairing lenses for Stereoscopic work, 15/-.

THE f/4 WIDE ANGLE ROSS XPRES LENS

The angle embraced by this lens is 70° and the definition is maintained from centre to margin at full aperture. Designed for special aerial surveying, it is eminently suitable for all classes of work where critical definition, together with large aperture and great covering power are required.

| Equiv. Focus | Plate Covered at Full Aperture | Price | Code Word Iris Setting | Code Word In Special Mounts with Long Screw threads and Clamping Flanges |
|----------------------------|---|--|--|---|
| in. 4 5 6 7 81 10 12 14 20 | in. $4\frac{1}{4} \times 3\frac{1}{4}$ or 5×4 5×4 or 5×5 $6\frac{1}{3} \times 4\frac{1}{4}$ 7×7 or 8×5 9×7 10×8 12×10 15×12 22×18 | f. s. d. 12 0 0 14 0 0 15 10 0 21 0 0 24 10 0 33 0 0 46 0 0 67 0 0 | Wads Wafs Wags Wais Wals Wams Wams Wars | Wadaf Wafaf Wagaf Walaf Walaf Wamaf Wapaf Waraf Wasaf |

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THE ROSS TELEROS LENSES



These lenses can definitely be claimed to be the finest of their type. The Teleros F 5.5 (Two Power) and F 6.3 (Three Power) give an image rather more than twice or three times as large respectively as that of an ordinary lens from the same viewpoint. Giving critical definition they are perfect for high speed photo-graphy of inaccessible objects and those difficult to approach.

PRICES ROSS TELEROS LENS, / 5.5 (Two Power

| Equiv. Focus | Size Plate | Flanze Inside dia. | Length Over- all | Inhibity Back Cell to Screen | Back Cell to Flange | Price in Iris Code Setting Wor | |
|--|---|--|--|------------------------------------|---------------------------|--|-----------------------|
| in. 61 9 11 12 13 17 22 40 f 8 | 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 | in. 12 12 12 12 12 12 12 12 12 12 12 12 12 | 1: 12 miles 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: | in. 31 41 536 536 638 8 10 20 | 12 | f s. d. 10 0 0 Tilas 11 10 0 Tilas 14 0 0 Tilcs 15 5 0 Tild 16 15 0 Tilds 27 10 0 Tilgs 47 0 0 Tilgs 85 0 0 Tilj | a e i o u |

Mounted in Focussino Settings.

| Equiv. | Flange Sizes | Price | Code Word | |
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Teleros Lenses in Iris Settings with threaded back cells for screwing into shutters.

| Equiv. Focus | Compur |
|-----------------|----------|
| in. | |
| 64 | No. 00-0 |
| 9 | , 0S |
| 11 | 1 18 |
| 13 | 2.4/1 |
| 17 | 3-6/1 |

^{*} In Leica Setting, complete with hinged finder mask.

ROSS TELEROS LENS, f.6.3 Three Power

| | | | | 1 4 144 6 6 | 2 0 11 0 2 | | | |
|----------------------|---|--------------------------|--------------------------|---------------------------------------|------------------------------|---|---------------|--|
| Equi. Foc. | Plate Covered | Flange Inside Dra. | Length Over- all | Infinity Back Cell to Screen | Back Cell to Flange | Price in Iris Setting | Code Words | Shutters Suitable |
| in. 9 13 17 | in. 2½ × 13 3½ × 2½ 4½ × 3¼ 64 × 48 | in. | in. 3 & 4 i 5 i | in. 3 % 4 k 6 k | in. | f s. d. 11 10 0 14 10 0 22 0 0 47 0 0 | Triret | 1 Compur 2/5 ,, 4 compound 5 ,, |

Prices in locussing settings on application.



THE ROSS HOMOCENTRIC LENSES

The Homocentric Lenses are excellent anastigmats, suitable for practically all branches of photography. The smaller sizes are most popular for small hand cameras. The single components of the F 6.3 and F 8 lenses give very good results with a medium stop.

PRICES
ROSS HOMOCENTRIC LENS, f/6.3

RUSS

| | | Plate C | overed | Flange | Price in Iris | Code | |
|--|------------------------|---|---|---|--|---|--|
| Equiv. | Focus | Full Aperture | Medium Stops | Sizes | Setting | Code Word Heath Hebra Hector Hecat | |
| mm. 127 140 152 165 178 218 254 305 380 | in. 5 5½ 6½ 7 8½ 10 12 | in. 44 × 31 44 × 32 5 × 4 51 × 32 72 × 4 72 × 5 81 × 62 10 × 8 12 × 10 | in. 5×4 6×5 $6\frac{1}{2} \times 4\frac{5}{4}$ $7\frac{1}{2} \times 5$ $8\frac{1}{2} \times 6\frac{1}{2}$ 10×8 12×10 15×12 | in. 1124-20-20-20-20-20-20-20-20-20-20-20-20-20- | s. d. 5 10 0 5 15 0 6 2 6 6 12 6 7 2 6 9 2 6 12 15 0 18 15 0 26 5 0 | Hebra Hector | |

ROSS HOMOCENTRIC LENS, f/8

| Equ | | Plate (| Covered | Flange | Price in Iris | Code |
|---|----------------------------|--|--|-----------------------------|--|---|
| Foo | | From | То | Sizes | Setting | Word |
| mm. 178 218 254 305 380 455 533 610 | in. 7 8½ 10 12 15 18 21 24 | $\begin{array}{c} \text{in.} \\ 6\frac{1}{2} \times 6\frac{1}{2} \\ 7\frac{1}{2} \times 5 \\ 8\frac{1}{2} \times 6\frac{1}{2} \\ 10 \times 8 \\ 12 \times 10 \\ 13 \times 11 \\ 15 \times 12 \\ 18 \times 16 \\ \end{array}$ | in. $8\frac{1}{2} \times 4\frac{3}{4}$ 10×8 12×10 15×12 18×16 22×18 25×22 30×24 | in. 11-2 22-24 22-4 33-4 34 | £ s. d. 6 15 0 8 5 0 11 0 0 15 0 0 20 0 0 28 0 0 37 0 0 47 0 0 | Hida Hiendel Hiffar Higor Hihone Hikur Hileh Himal |

Special Focussing Mounts, provided with Iris Diaphragms, are supplied at a small extra cost for use with Cameras of fixed extension. These special mounts do not admit of between-lens shutters.

Cost of pairing two Lenses for Stereoscopic Work, 15/-



THE ROSS PROCESS XPRES LENS AND REVERSING PRISMS FOR LINE, HALF-TONE AND THREE-COLOUR WORK.

The Process Xpres Lens has been specially designed to meet the most exacting requirements of all branches of modern process work. It is unrivalled for three-colour photography and the finest line and half-tone work.

PRICES

| F | Focus | | | Aperture | a tu | ate covered t full aper- are copying same size | F | rice | Code Word | Prism No. |
|--|-------|---|--|---|------|---|---|---|---|---------------------------------------|
| mm. 330 406 460 530 635 760 914 1066 1130 | | in. 13 16 18 21 25 30 36 42 48 | | F/9 F/10 F/10 F/10 F/16 F/16 F/16 F/16 | | $\begin{array}{c} 13\times 9\\ 15\times 12\\ 18\times 13\\ 20\times 16\\ 25\times 18\\ 30\times 20\\ 36\times 24\\ 40\times 30\\ 45\times 36 \end{array}$ | 15 20 24 28 38 48 68 87 110 | s. d. 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | Phaba Phace Phadi Phafo Phagu Pheha Pheje Pheli Phemo | 1 1a 2 3 4 4 5 6 |

ROSS

If a Lens is required with a Reversing Prism add the letter "P" to code-word for Lens.

ROSS REVERSING PRISMS for Photo-Mechanical Work

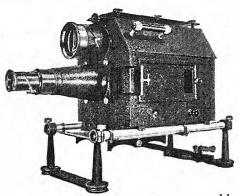
These Prisms are made of carefully annealed colourless crown glass and are accurately rectangular. The mount of the Prism screws directly to the hood of the lens, bringing one of the non-reflecting surfaces close up to the front lens. The Prism is thus used to full advantage. The Hypotenuse surfaces are silvered to ensure complete reflection. To obtain accurate centering it is necessary to send your lens when ordering.

PRICES of Prisms mounted in Metal Box with revolving collar.

| No. | | Breadth of non- ng surfaces | P | rice | Code Word |
|------------------------|--------------------------------------|-----------------------------------|----------------------------|--|--|
| 1 1a 2 3 4 | in. 212 224 3 314 312 | mm. 65 70 75 80 90 | 18 22 26 30 38 | s. d. 0 0 0 0 0 0 0 0 0 0 | Promote Promost Promont Promove Prompt |

Prices for Apochromatic Lens of similar foci for colour work and Prisms of larger size on application.

THE ROSS EPIDIASCOPE



HE vast experience of Ross Ltd. has enabled them to produce a most efficient Epidiascope at a reasonable price, and embodying many exclusive features which

place this instrument in a class by itself.

The lenses are of the finest optical quality and give perfect definition. A new system of illumination and ventilation enables the most valuable and delicate specimens to be shown without fear of damage by heat.

Opaque objects and lantern slides are projected with equal brilliance, whilst the placing and withdrawing of opaque

objects is most easily effected.

The change over from episcopic to diascopic projection is

very simple and effected almost immediately.

A metal pointer with universal adjustment allows the lecturer to draw attention to any part of the object shown whilst still operating the instrument.

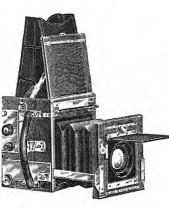
When the instrument is tilted, critical definition is easily secured by the adjustment of a screw on the front of the Lamphouse.

THE PRICE

"Ross" Epidiascope with Condensers, Mirrors, 101 ins. focus large aperture diascopic and 17 ins. ditto episcopic projection lenses, Ŝlide Carrier for either English or Continental size lantern slides, Table Stand, complete but without projection Lamp is

£35 10

Extra for: 500-Watts Lamp 1000-Watts Lamp Descriptive and illustrated booklet sent post free on application. LONDON, S.W.4 CLAPHAM COMMON ROSS LTD.



THE ROSS STANDARD REFLEX CAMERA

This camera is of the highest quality and best workmanship throughout. It is fitted with every adjustment necessary for the finest reflex work but has no elaborate andunnecessary movements to complicate the working of the camera and get out of order.

Among several special features is the focal-plane shutter. With this shutter the various speeds are obtained by simply altering the width of the slit.

Complete details and specification on application.

PRICES

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|--|---|--|--|---------------------------------------|-------------------------------|------------------|----------------|------------------------------|-------------------|----------|-----------|-----------------|----------------------------|------------------|-----------------------|---------------|-------------------|----------------|
| Camera with 3 Solid Slides, no lens With Ross Xpres, f/2,9 Code Words With Ross Xpres, f/3.5 Code Words With Ross Xpres, f/3.5 | 23 51 39 Mi 51 35 Mir 41 30 | nile " ler 0 nim " ler 10 | 0 IS 0 X IS 0 op 1S 0 | 23 61 41 Re 61 37 R | lo lefbe lefbe lefju | 0 is 0 x is 0 it | 61 41 Re 61 37 | ler 0 efjæ ler 0 | 0 15 0 8 | 30 | 0 | d. 0 | 71 46 Re 61 40 | o leika | ons ouv ns o | 70 R 54 | 0 " le 0 tefli | ons oy o |
| Code Words With Ross Homocentric Lens, f.6.3 Code Words Solid D.D. Slides, each Book-Form Slides, each | 29 Mi | onifi 15 | 0 ap | 29 R | eful 5 efla 15 | 0 p | 33 Re | few 2 effa 18 | 6 6 | 41 Re | fst 18 | 0 er 6 | 36 Re | 2 flo 18 | 6 or 6 | 49 R | efio | 6 at |
| For Swing Front, extra Changing Box for 12 plates | 3 | 8 | 6 | 1 | 8 | 6 | 3 5 | 15 | 0 | 1. | 15 | 1 | 4 5 | · | 0 | | 15 17 | 0 |
| Film-pack Adaptor Antinous Release, extra | 1 0 | 15 | 0 | 1 0 | 15 | 0 | 2 0 | _ | 6 | 0 | | | 0 | _ | | | 16 5 | 6 |

ROSS

New Shutter Release Time Valve, 40/-. Stereo Focussing Magnifier, fits hoods of all cameras, £1 1s. 0d The post-card size cameras are not fitted with reversing back. Leather Cases for any outfit to order. Prices for Continental sizes post free on application.

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ROSS EXTRA WIDE FIELD





STEREO PRISM BINOCULAR

MAGNIFICATION 7 DIAMETERS "STEPNITE"

'S TEPNITE" has been specially designed for use at dusk and for observation at night.

The light transmitting power is very greatly in excess of that of any prism binocular previously made, and by reason of large prisms and lenses and eyepieces of special design, the illumination at margins of field is 137 per cent. greater than that obtained with other binoculars of the same power and aperture. Further, the central illumination is fully 20 per cent. greater and the perfect definition is maintained over practically the whole field, whereas in other types of binoculars the definition falls off rapidly towards the margins of field. These qualities of great luminosity and critical definition at margins of field make this binocular unsurpassable for the use of officers of the Navy and Mercantile Marine, Yachtsmen, Huntsmen, Sportsmen, Surveyors and others.

With "Stepnite" objects can be picked up and clearly seen immediately they enter the field of vision, whereas generally these objects escape notice altogether.

| Effective diameter of Object Glasses 50 mm. Real Field of View Linear per 1,000 yards | 70 | Stereoscopic Power Weight of Binocular Price Code Word | £21 10 0 |
|---|----|---|------------|
| Dogg-i-4: | | code word | "Stepnite" |

Description and illustrated booklet of other models and of telescopes post free on request.

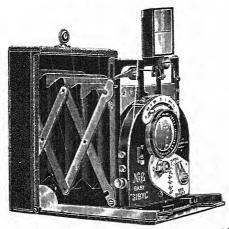
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N&B "BABY" SIBYL



THE FIRST AND STILL THE BEST MINIATURE CAMERA.

Full Vertical and Horizontal rise. "N & G" Shutter, with Accurate Speeds.

Accurate focussing scale. ½ sec. to 1/200th sec. Weight of plate model, 9 ozs. only.

Complete Catalogue of Cameras and Sundries Post Free.

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PATENT FOLDING REFLEX.

Manufactured in Two Models: ---

SPECIAL, F 2.9 and F 3.5 Lenses

STANDARD. F/4.5

ONE SIZE ONLY. 31" × 21" or 61 × 9 c.m.

The product of over thirty years' experience in the design and construction of the best.

The Camera is finished in the usual "N & G" style; to previous users of our apparatus no more need be said, it is simple and straightforward to manipulate and is by far the most practical and successful Folding Reflex on market.



CAMERA OPEN.-Is as rigid as a Box Form Reflex. Focussing by means of focussing mount on each lens supplied. The camera is entirely self-contained, with no projections, a long handle being provided.

SHUTTER.—The "N & G" Self-capping, quick wind focal te shutter is fitted. Speeds from 1/10 to 1/800th of a second, with plane shutter is fitted. ball and time.

THE MIRROR is very light, free from noise and vibration; all movements are of the finest steel to eliminate wear.

THE RELEASE is on left side of camera, leaving right hand free for focussing, and is delicate, yet positive. Antinous or pneumatic releases can be supplied.

THE REVOLVING BACK is adapted to take either "N & G" double book-form metal slides, "N & G" film pack adapter, roll holder, or "N & G" changing boxes.

RISING, FALLING AND HORIZONTAL SWING FRONT movements are provided in Standard Model only.

LENSES.—Only the highest grade British Lenses are fitted of F/4.5 aperture, and 5½ in. focal length in the Standard Model, and F/2.9 and F/3.5 of approx. 5½ in., in the Special Model. These are quickly interchangeable with large aperture fixed focus telephoto lenses, of the Ross F/5.5 "Teleros" and Dallmeyer F/5.6 "Dallon" type, by means of the "N & G" quick change lens flange.

MAGNIFIER LENSES in hood, folding inside. A Tripod Bush is provided. The Standard Model weighs only 3 lbs. 8 ozs., complete with F/4.5 lens. Duralumin body-work, and in other parts where possible, the Camera is absolutely climate proof.

<u> Տարագանանությունը հանաստանությունը անանականության անանականության հանականությունը հանականությունը հայարականութ</u>

| Camera cor | nplete with | 3"N& | G" Doub | le Meta | Book | Form | Dark | Slides, | Dark | Slide |
|-------------|-------------|-----------|-----------|---------|------|------|------|---------|------|-------|
| Adapter, ar | nd Hooded | Focussing | g Screen. | | | | | | | |

| | PRICES. | | |
|--|--|--|---|
| PATENT | FOLDING | REFL | EX. |
| Camera complete with 3 " N & Adapter, and Hooded Focussis | k G" Double Metal Book | Form Dark | Slides, Dark Slid |
| STANDARD MODEL. Fitted with Ross F/4 5 | Cores Lens 51 in. | | 47 10 |
| Fitted with Dallmeyer F/ | 4.5 Serrac Lens, 51 in. | *** | 47 0 |
| Ross F/5.5 Teleros Lens, 11 in | . focus | *** | 18 5 |
| SPECIAL MODEL. Fitted with Ross F/2.9 X | pres Lens, 53 in, | | 57 0 |
| Fitted with Dallmeyer F/ | 2.9 Pentac Lens, 5½ in. | | 56 0 |
| Fitted with Dallmeyer F/ | 3.5 Dalmac Lens, 6 in. | ••• | 51 0 |
| Dallmeyer F/5.6 Dallon Telep | hoto Lens, 10 in, focus | | 18 10 |
| // OID | VI U CARAF | · · · · · · | in hidden water is provinced, and option that many any ordered and market had the support |
| "SIB | YL" CAME | KAS. | |
| PLATE MODELS, cor Dark Slic | nplete with 3 "l des and Focussin | N & G'' N g Screen. | letal Double |
| Lens. | Baby New $4\frac{1}{2} \times 6 \text{ c/m}$ $3\frac{1}{2} \times 2\frac{1}{2} \text{ c}$ | Special or 6½×9 c/m | New Ideal ‡-plate or 4‡ × 3‡ |
| Ross F4.5 Xpres | £19 5 0 £23 | 0 0 | Double |
| Dallmeyer F4.5 Serrac | 19 5 0 18 10 0 22 | 5 0 | cannot |
| The New "Sibul Y | litage 22 21 vol in | or 61 v O alm | be supplied |
| Ross F/3.5 X pre | ritesse. $3\frac{1}{2} \times 2\frac{1}{2}$ iii. | or of x 9 c/m | |
| Dallmeyer F/3.5 | Dalmac Lens 2 | 8 0 0 | |
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| Dallmeyer F4.5 Serrac | be supplied 2 | 0 10 0 | 24 5 0 |
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| | OLL FILM MODEL | .S. 41 × 2 | 1 |
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| Ross F4.5. T.T. and H Dallmeyer | X pres I. F4.5 Sibyl Aviar F4.5 Serrac | 29 10 0 28 15 0 | |
| The Ne Ross F4.5 T.T. and H Dallmeyer Lens. | Xpres | 29 10 0 28 15 0 w Special or 61 × 9 c/m | New Ideal 4-plate or 44 × 31 |
| Ross F4.5 T.T. and H Dallmeyer I.ens. Ross F4.5 Xpres | Xpres | 29 10 0 28 15 0 w Special or 6½ × 9 c/m | New Ideal 1-plate or 41 × 31 |
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| Ross F4.5. The Ne Ross F4.5. T.T. and H Dallmeyer I.ens. Ross F4.5 Xpres T.T. and H. F4.5 S1BYI. Aviar Dallmeyer F4.5 Serrac Wray F4.5 Lustrar | Rational Control Con | 29 10 0 28 15 0 w Special or 6½ × 9 c/m 3 0 0 2 5 0 5 0 | New Ideal 1-plate or 41 × 31 £-26 0 0 0 26 0 0 25 5 0 24 5 0 |
| Ross F4.5 Xpres T.T. and H. F4.5 Sibyl Aviar Dallmeyer F4.5 Serrac Wray F4.5 Lustrar TELE-PHOTO LEN | Apres | 29 10 0 28 15 0 w Special or 6½ × 9 c/m 3 0 0 2 5 0 5 0 | New Ideal 1-plate or 41 × 31 £26 0 0 25 5 0 24 5 0 Cameras. |
| PATENT Camera complete with 3 " N & Adapter, and Hooded Focussis STANDARD MODEL. Fitted with Ross F/4.5 Y Fitted with Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in SPECIAL MODEL. Fitted with Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.6 Dallon Telep Ross F/5.5 Teleros Lens, 11 in Dallmeyer F/5.5 Serrac Wray F/5.5 Lustrar The New "Sibyl V Ross F/3.5 X pre Dallmeyer F/5.5 Serrac Lens, 12 in Telep Ross F/5.5 Teleros Lens, 12 in Ross F/5.5 Teleros Lens, 12 in Ross F/5.5 Teleros Lens, 13 in Ross F/5.5 Teleros Lens, 14 in Ross F/5.5 Teleros Lens, 15 in Ross F/5.5 Teleros Lens, 15 in Ross F/5.5 Teleros Lens, 16 in Ross F/5.5 Teleros Lens, 17 in Ross F/5.5 T | SES for use with | 29 10 0 28 15 0 w Special or 6½ × 9 c/m 3 0 0 2 5 0 5 0 "Siby!" | New Ideal 1-plate or 41 × 31 £26 0 0 26 0 0 25 5 0 24 5 0 Cameras. (10 init,)£10 10 |

| Lens. | 4½× | aby 6 c | | New Special $3\frac{1}{2} \times 2\frac{1}{2}$ or $6\frac{1}{2} \times 9$ c/m | New Ideal 1-plate or 41 × 31 |
|--|--------|--------------------|---|---|---------------------------------------|
| Ross F4.5 Xpres T.T. and H.F4.5 SIBYL Aviar Dallmeyer F4.5 Serrac Wray F4.5 Lustrar | 18 | 5 5 10 10 | | £23 0 0 22 5 0 21 5 0 | Double Dark Slides cannot be supplied |
| The New "Sibyl | Vitess | e." | - | $3\frac{1}{2} \times 2\frac{1}{2}$ in. or $6\frac{1}{2} \times 9$ c/m | 1. |

| | ins | stea | d of Double | Dark | Slid | es. | | _ | ••• | u C. | 3, |
|-----------------|-----|------|--------------------|------|------|-----|---|----|-----|------|----|
| Ross F4.5 Xpres | | | Single Dorle Slide | £21 | 10 | 0 | £ | 25 | 0 | 0 | - |

| Ross F4.5 Xpres T.T.and H. F4.5 SIBYL Aviar Dallmeyer F4.5 Serrac Wray F4.5 Lustrar Single Dark Slides cannot be supplied | £21 10 20 10 19 10 | 0 | £25 25 24 23 | 0 0 5 5 | 0 0 0 | |
|--|--------------------------|---|-----------------------|---------|-------|--|
|--|--------------------------|---|-----------------------|---------|-------|--|

| The. | New | "; | Sibyl | ,, | Excelsior." | 41×5 | 21 |
|------|-----|----|-------|----|-------------|------|----|
| | | | | | | | |

| Ross F4.5 Xpres | ••• | £29 1 | |
|------------------------------|-----|-------|----|
| T.T. and H. F4.5 SIBYL Aviar | ••• | 29 1 | |
| Dallmeyer F4.5 Serrac | | 28 1 | 50 |

| . I.ens. | Baby | | | | ecial ½×9c/ | New m ‡-plate | Ide | eal 11 × | 31 |
|---|---------------------------------|-------|-----------------|-------------|----------------|-----------------------|------------------|-------------|----|
| Ross F4.5 Xpres T.T. and H. F4.5 Sibyi Aviar Dallmeyer F4.5 Serrac Wray F4.5 Lustrar | £19 15 19 15 19 0 18 0 | 0 0 0 | £23 22 21 | 0 5 5 | 0 0 0 | £26 26 25 24 | 0 0 5 5 | 0 0 0 | - |

| Dallmeyer F6.5 Dallon | (5½ in.)£5 10 0 | (9 in.) £8 12 6 | (10½in.)£10 100 |
|-----------------------|------------------|-----------------|-----------------|
| Ross F5.5 Teleros | (6½ in.) 10 10 0 | (9 in.) 12 5 0 | (11 in.) 14 150 |

Kodak Photographs the World!

In the pages which follow it is only possible to give a brief outline of some of the leading products and activities of Kodak—the largest photographic organisation in the world.

For full descriptive information of the immense and comprehensive list of Kodak Supplies—whether in the sphere of amateur or professional photography, of photofinishing or photo-mechanical work, of cinematography or scientific (including medical) work—please refer to the nearest Kodak House.

Kodak Service—authoritative advice on any aspect of photographic technique or business—will also be freely placed at your disposal by the nearest Kodak House.

Kodak dealers throughout the world carry stocks of Kodak Supplies, and will be pleased to pass on enquiries to the appropriate department.

ALL PRICES APPLY TO GREAT BRITAIN ONLY

See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.



KODAK LTD., KODAK HOUSE KINGSWAY, LONDON, W.C.2 Branches of Kodak Limited in the British Isles

LONDON . . . Kodak House, Kingsway, London, W.C.2 184-186 Regent Street, W.1

59 Brompton Road, S.W.3 96 Victoria Street, S.W.1 91 Bishopsgate, E.C.2

BIRMINGHAM. . 45 Corporation Street, 2

LIVERPOOL 70 Lord Street, 2

NEWCASTLE-ON-TYNE 110 Grainger Street, 1
GLASGOW. 46 Buchanan Street, C.2
DUBLIN 89 Grafton Street, C.3

Principal establishments from which Kodak Supplies can be obtained in overseas countries:

ALGERIA. Kodak-Pathé S.A.F., 24 Rue De Tanger, Algiers.

ARGENTINE. Kodak Argentina Ltd., Calle Paso, 434 Buenos Aires.

AUSTRALIA. Kodak (Aust.) Pty. Ltd., Southampton Crescent,

Abbotsford, Victoria, 9.

AUSTRIA. Kodak G.M.B.H., 111 Beatrixgasse 25, Vienna.

BELGIUM. Kodak Ltd., 43 Rue De Stassart, Brussels.

BRAZIL. Kodak Brasileira Ltd., Rua Sao Pedro 268, Rio De Janeiro.

CANADA. The Canadian Kodak Co., Toronto 9, Ontario.

CEYLON. Platé Limited. Colpetty, Colombo.

CHILE. Kodak Chilena Ltd., Delicias 1472, Santiago.

CHINA. Eastman Kodak Co., 185 Yuen Ming Yuen Road, Shanghai.
COLOMBIA. Kodak Colombiana Ltd., Calle Caldas Entre 20 De Julio Y Cuartel, Barranquilla.

CUBA. Kodak Cubana Ltd., Zenea 236, Havana.

CZECHOSLOVAKIA. Kodak Spol, S.R.O., Biskupsky Dvur 8, Prague II.

DENMARK. Kodak Akt., Vodroffsvej 26, Copenhagen.

DUTCH EAST INDIES. Kodak Ltd., 38 Noordwijk, Batavia Centrum, Java.

EAST AFRICA. Kodak (E. Africa) Ltd., Zebra House, Government Road, Nairobi.

EGYPT. Kodak (Egypt) S.A., 20 Sharia Maghraby, Cairo.

ESTONIA. H. Sahme, Harju 27, Tallinn.

FINLAND. O/Y Valovarjo A/B, Norra Esplanadgatan 35, Helsingfors.

FRANCE. Kodak-Pathé S.A.F., Rue Francois Ier 17, Paris.

GERMANY. Kodak Aktiengesellschaft, Lindenstrasse 27, Berlin, S.W.68.

GREECE. Kodak (Egypt) S.A., 18 Stadium Street, Athens.

HAWAIIAN ISLANDS. Kodak Hawaii Ltd., 817 Alakea Street,
Honolulu.

HOLLAND. Kodak N.V., 76 Anna Paulownastraat, The Hague.

HUNGARY. Kodak Ltd., Postafiok 146, Budapest 4. ICELAND. Hans Petersen, 4 Bankastraeti, Revkjavik.

INDIA. Kodak Ltd., Kodak House, Hornby Road, Bombay.

ITALY. Kodak S.A., Via Vittor Pisani 6, Milan.

Kodak Photographs the World!

JAPAN. Kodak Japan Ltd., 2 & 3 Sanbanchi, Nishiroku-Chome Ginza, Kyobashiku, Tokio.

JUGOSLAVIA. Kodak D.S.O.J., Ilica 24, Zagreb.

MEXICO. Kodak Mexicana Ltd., San Jeronimo 24, Mexico D.F.

NEW ZEALAND. Kodak New Zealand Ltd., 16-18 Victoria Street, Wellington.

NORWAY. J. L. Nerlien A/S, Nedre Slottsgate 13, Oslo.

PALESTINE. Kodak (Egypt) S.A., Jaffa Road, Haifa.

PANAMA. Kodak Panama Ltd., 111 Central Avenue, Panama City.

PERU. Kodak Peruama Ltd., Divorciadas 650, Lima.

PHILIPPINE ISLANDS. Kodak Philippines Ltd., 434 Dasmarinas, Manila.

POLAND. Kodak Sp.Zo.O., 5 Plac Napoleona, Warsaw.

PORTUGAL. Kodak Ltd., Rua Garrett 33, Lisbon.

ROUMANIA. S.A.R. Kodak, Str. General Lahovari 42, Bucarest:

SOUTH AFRICA. Kodak (S.A.) Ltd., Kodak House, corner of Shortmarket and Loop Streets, Cape Town.

SPAIN. Kodak S.A. Puerta Del Sol 4, Madrid.

STRAITS SETTLEMENTS. Kodak Ltd., 130 Robinson Road, Singapore.

SWEDEN. Hasselblads Fotografiska Aktiebolag, Ostra Hamngatan 41 and 43, Göteborg.
 SWITZERLAND. Kodak S.A., Ave Jean-Jacques Mercler 13,

Lausanne.

SYRIA. Kodak (Egypt) S.A., Rue Weygand, Beyruth.

TURKEY, Kodak (Egypt) S.A., No. 3 Ensiz Sokak, Beyoglou, Istanbul.

UNITED STATES. Eastman Kodak Co., Rochester, New York. URUGUAY. Kodak Uruguaya Ltd., Calle Colonia 122, Montevideo.

KODAK FACTORIES

U.S.A. Rochester, New York. AUSTRALIA. Abbotsford,

Victoria.
CANADA. Toronto.

FRANCE. Vincennes, Paris.

GERMANY. Copenick, Berlin.

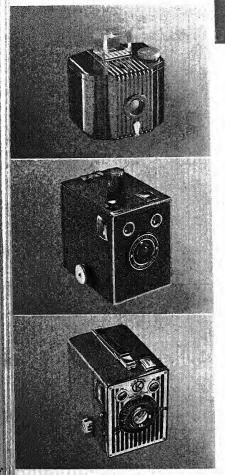
GERMANY. Stuttgart.

GREAT BRITAIN. Harrow, Middlesex.

HUNGARY, Vac.

The Kodak Factory at Harrow is the second largest photographic works in the world. (The Kodak Factory at Rochester, New York, U.S.A., is the largest.)

The Harrow Factory covers 17 acres of floor space, and with the English distributing organisation gives employment to about 4,000 British employees.





"KODAKS" AND "BROWNIES"

"Kodaks" and "Brownies," always famous for their soundness of construction and simplicity of operation, today form a range of cameras which embody the latest results of scientific research and the most advanced manufacturing methods. From the child or beginner to the serious worker or 'miniature' enthusiast, every photographer will find a model which will exactly suit his needs, and give him long, dependable and trouble-free service.

"BROWNIES"

"Brownies" have always been world favourites, and to-day the large number of models caters for a very wide variety of needs. From the least expensive model, the Baby "Brownie"—which sells at 5/- and in spite of its diminutive size takes snapshots $2\frac{1}{2} \times 1\frac{5}{5}$ in.—to the very versatile Six-20 "Brownie" at 21/—which takes $3\frac{1}{4} \times 2\frac{1}{4}$ in. pictures of landscapes, groups or portraits without focussing or attachments—all possess the virtues of simplicity, sound workmanship and great picture-taking ability.

Full list and details of "Brownies" on request.

ALL PRICES APPLY TO GREAT BRITAIN ONLY

See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.

Photographs the World!

"KODAKS"

SIX-20 & SIX-16 "KODAKS" JUNIOR

Technical excellence, great simplicity in use, convenience in handling—these are the qualities which every camera in this series gives at an extremely popular price. They are neat,

unusually compact (on account of the slim 620 spool) and—opening with a single movement—are very quick in operation.

Choice of lens equipment includes fast Kodak Anastigmat f6.3. Lens-mount focussing. Six-20 "Kodaks" Junior take 8 pictures, 3½×2½ in., on 620 Kodak Film. Six-16 "Kodaks" Junior take 8 pictures 4½×2½ in. on 616 Kodak Film.

Six-20 "Kodaks" Junior from 39/6 Six-16 "Kodaks" Junior from 47/6

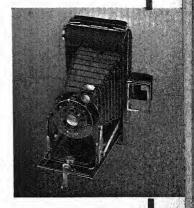
SIX-20 & SIX-16 "KODAKS"

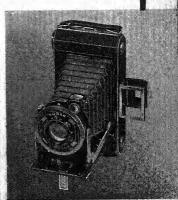
A magnificent range of luxuriously equipped cameras. Every model has a fast anastigmat lens—f6.3 or f4.5—and there is a choice of precision shutters, including the eight-speed Compur.

Most models are equipped with a built-in delayed action device for self-photography; all have two view finders—waist-level reversible reflecting, and eye-level direct vision. Lens mount focussing. In finish, appearance and attention to detail, these "Kodaks" are unexcelled.

Six-20 "Kodaks" take 8 pictures $3\frac{1}{4} \times 2\frac{1}{2}$ in. on 620 Kodak Film. Six-16 "Kodaks" take 8 pictures $4\frac{1}{4} \times 2\frac{1}{2}$ in. on 616 Kodak Film.

Six-20 "Kodaks" from £3 12 6 Six-16 "Kodaks" from £3 17 6

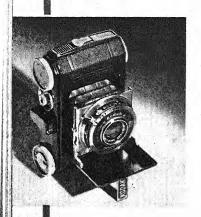




FULL LIST AND DETAILS OF "KODAKS" ON REQUEST

Kodak Cameras-continued

A high-precision "miniature" camera—THE "RETINA"



Though remarkably low in price this camera is designed and built with the meticulous accuracy essential for this type of apparatus. Takes economical 35 mm. Kodak Film ("Panatomic" or Super Sensitive Panchromatic), 36 exposures at one loading. Schneider "Xenar" f3.5 lens, Compur shutter, working to 1/300th or 1/500th second.

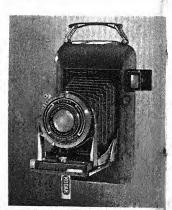
With Compur shutter working to 1/300th second .. £10 10 0
With Compur Rapid shutter working to 1/500th second £12 0 0

The modern "streamline" of this new model suggests the scientific precision of its design. Though equipped with every advanced feature—including a coupled range-finder—everything is "built-in" and housed within the body of the camera.

Features are: Coupled range-finder, optical eye-level view finder, Zeiss Tessar f4.5 lens, Compur shutter, working to 1/4ooth second. The camera will take either 8 pictures $3\frac{1}{4} \times 2\frac{1}{4}$ in. or 16 pictures $2\frac{1}{4} \times 1\frac{5}{8}$ in. on 620 film.

(Available in March, 1936)

KODAK "REGENT"



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Kodak
Photographs the World!

Kodak Photographs the World!

KODAK ROLL FILMS AND FILM PACKS

IN FOUR GRADES, EACH PRE-EMINENT OF ITS TYPE

Since Kodak Film—the first roll film—was introduced more than forty years ago, constant research has resulted in progressive improvements in its quality. First in time, Kodak Film is still the first in performance. To-day, four different grades offer an unrivalled choice of negative material to every photographer, from the simple snapshotter to the most advanced worker; from the owner of a "Brownie" to the user of a high-precision miniature camera. Kodak Film is the photographer's counterpart of the Film upon which leading Motion Picture studios in England and the United States and on the Continent rely for the successful recording of their great and costly productions.

REGULAR KODAK FILM

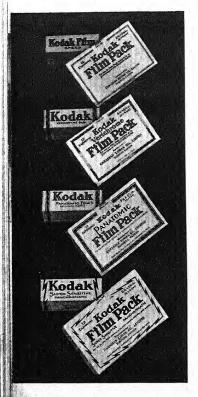
The supremely reliable film for snapshots in fair weather, and time exposures under any conditions. Good latitude.

KODAK "VERICHROME" FILM

"Verichrome" is coated with two layers of sensitive emulsion, one slow and one fast. The first corrects over-exposure, the second helps to prevent under-exposure. It has high speed, enormous latitude and reproduces the finest detail in high lights and shadows. In addition, "Verichrome" is more colour sensitive than Regular film, while its anti-halation backing guards against the effect of blur or glare which may result from brilliant high lights in the picture.

(Kodak Film continued overleaf)

See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.



Kodak

Kodak Film-continued

KODAK "PANATOMIC" FILM

The finest all-purpose film in the world. "Panatomic" is fully panchromatic, and produces pictures which are extraordinarily rich in tone and crisp in detail. Its extremely fine grain gives wonderful enlargements, even from the smallest negative; it is the supreme film for 'miniature' work. Double coating gives great latitude, and its speed is ample for all normal subjects. Very sensitive to artificial light. Anti-halation backed.

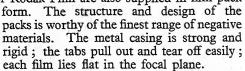
KODAK SUPER SENSITIVE PANCHROMATIC FILM

Fully panchromatic film of lightning speed. Whenever extremely short exposures have to be given for work in difficult lighting conditions, or by artificial light, Kodak Super Sensitive Panchromatic Film gives the greatest degree of success. Double coated. Anti-halation backed.

KODAK FILM PACKS

Regular—"Verichrome"—"Panatomic"—Kodak
Super Sensitive Panchromatic

All four grades of Kodak Film are also supplied in film pack



Kodak Film Packs are easy to handle in the dark room and in the camera.

See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.

Photographs the World!

CINÉ-"KODAKS" AND "KODASCOPES"

CINÉ-"KODAK"

Since introducing the first 16 mm. and 8 mm. equipment, Kodak have perfected a range of sub-standard apparatus and materials for every type of work—amateur, commercial and scientific. From the Ciné-"Kodak" Eight, most economical of all movie cameras, to the infinitely adaptable "Special" which is equipped for every known effect; from the Business "Kodascope," last word in portable ciné salesmanship, to the "Kodascope" Model L with its interchangeable lamps and lenses, every phase of camera work and projection is fully covered.

CINÉ-KODAK EIGHT APPARATUS

CINÉ-"KODAK" EIGHT-20. Pocket size camera, holds twenty-five feet of Ciné-Kodak 8 film—equivalent in showing time to one hundred feet of 16 mm. film. Direct vision finder; self-setting footage meter; spring-driven motor.

With Kodak Anastigmat f3.5 Lens (fixed focus) **£9 17 6** With Kodak Anastigmat f1.9 Lens (focusing) **£15 0**

CINÉ-"KODAK" EIGHT-60

De luxe Ciné-"Kodak" Eight camera. Leather covered, with chromium-plated metal parts. Lens interchangeable with telephoto.

With Kodak Anastigmat f1.9 Lens and felt lined Leather Case, with accommodation for telephoto lens, colour filter and two cartons of film £25 0 0

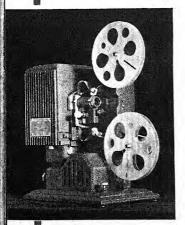
ALL PRICES APPLY TO GREAT BRITAIN ONLY



Ciné-"Kodaks" and "Kodascopes"-continued

"KODASCOPE" EIGHT - 30. Eight millimetre Projector. Holds two hundred feet of film. Works from any house lighting circuit, 100-120 or 200-250 volts. Projects pictures up to 30 × 22 in.

Motor-driven rewind, with splicing and oiling outfit £9



"KODASCOPE" EIGHT-80

Eight millimetre Projector with 300watt illumination. Projects pictures up to 40 × 30 in. or larger. Fan-cooled lamp-house, 'still picture' device, motor speed control, many refinements.

With one-inch lens, carrying case, two lamps, oiling outfit, splicing outfit, two 200-ft. reels, one Humidor Can and variable resistance for 200-250 volts.

£33 0 0

CINÉ-KODAK 16 mm. APPARATUS

CINÉ-"KODAK" BB JUNIOR

16 mm. Camera; holds fifty feet of film. Direct vision view-finder. Spring driven motor. Footage indicator. Exposure guide.

With Kodak Anastigmat f3.5 Lens (fixed focus) . . . £13 13 0 With Kodak Anastigmat f1.9 Lens (focussing) . . . £18 18 0

CINÉ-"KODAK" K

De luxe 16 mm. camera. Holds fifty feet or one hundred feet of film. Half-speed device. Interchangeable lens.

With Kodak Anastigmat f1.9 Lens,

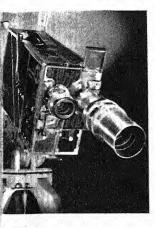
ALL PRICES APPLY TO GREAT BRITAIN ONLY



CINÉ-KODAK ACCESSORIES comprise a comprehensive range of apparatus for increasing the cinematographer's scope in film taking, showing and editing. Every movie-maker should know about these accessories—ask for particulars.

Kodak Photographs the World!

CINÉ-" KODAK "



"KODASCOPE" L

A 16 mm. Projector of the highest quality, designed for use

application.

with any one of four lenses and three lamps (300, 500 and 750 watt). The right combination from among these twelve lenslamp units, gives perfect projection under all conditions.

"Kodascope" L, 100-volt Model (without lamp), one-inch or two-inch lens, splicing and oiling outfits, two 400-ft. reels, one Humidor Can, table lamp (without bulb) and carrying case £67 10 0 Resistances for 200/250 volts,

for 300-watt lamp . . . 3 17 6
for 500 and 750-watt lamp . . 7 10 0
Lamps . . . from 1 6 0
Further details of Ciné-"Kodaks" and "Kodascopes" and particulars of accessories on

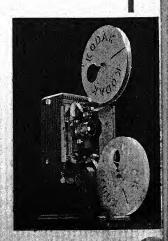
See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.

Finest of all 16 mm. cameras. Equipped for all advanced effects of professional cinematography; combines the technical advantages of a standard size movie camera with the low running costs of 16 mm. film. Write for fully illustrated brochure. With Kodak Anastigmat f1.9 Lens, three-inch f4.5 lens, 100-ft. film chamber, set of six masks and oiling outfit ... £155 0 0

"KODASCOPE" D

A first-rate 16 mm. Projector. Holds four hundred feet of film. Powerful 300-watt illumination gives brilliant pictures 40×30 in. at 14 feet. Runs from any house-lighting circuit 100-120 or 200-250 volts. High-speed rewind, motor-driven fan, 'still picture' device.

"Kodascope" D, with supplementary resistance, splicing and oiling outfit £25 0 0





CINÉ-KODAK FILM

BLACK and WHITE

Kodak originated 16 mm. and 8 mm. cinematography, and Ciné-Kodak Film is the leading sensitive material in both these widths. The great advantages of the reversal system led to its adoption by Kodak for all amateur movie films. It provides for movies of finer quality and greater brilliance and allows bigger pictures to be projected.

CINÉ-KODAK PANCHROMATIC SAFETY FILM 16 mm. CINÉ-KODAK SUPER SENSITIVE PANCHROMATIC SAFETY FILM 16 mm.

CINÉ-KODAK 8 PANCHROMATIC SAFETY FILM

"KODACHROME" FILM 16 mm.

A new revolutionary invention which makes it as easy to produce brilliant, full-colour movies, entirely free from grain, mosaic or colourfringing, as it is to produce black and white films.

In exposing, a lens stop one or two sizes larger than that used for panchromatic film is employed. Filters are not required, except for work in artificial (Photoflood) light, and for very distant scenes out-of-doors. The filters then used do not increase the necessary exposure. Any 16 mm. projector can be used, and no extra illumination or filters are required. Being entirely free from grain (all silver is eliminated in processing) "Kodachrome" can be projected to a large size without any loss of quality.

Available in March.

CINÉ-KODAK FILM PROCESSING STATIONS

In whatever country they may be, travellers and tourists can always get prompt processing service from the nearest establishment in the world-wide chain of Ciné-Kodak Film Processing Stations. Particulars of the service available in any locality are obtainable from the nearest Ciné-Kodak dealer or Kodak House, or from list supplied with each roll of Ciné-Kodak Film.

See pages 16-17 for list of principal establishments at which Kodak supplies can be obtained overseas.



Photographs the World!

KODAK SUPPLIES KODAK SERVICE

FOR PROFESSIONAL AND COMMERCIAL PHOTOGRAPHY

In no sphere of art or business is the need of the finest quality of material more urgent than in professional photography. So many factors play a part in the production of the finished picture that unless all equipment and materials are of the very best, even the greatest skill on the part of the photographer may be sacrificed. In Kodak Professional Supplies the professional worker will find a source of apparatus and material which is not only absolutely dependable, but is also sufficiently comprehensive to cover every requirement of even the most specialised worker.

From a complete studio lighting installation to the last darkroom sundry, from an anastigmat lens to a card index system for keeping studio accounts, no item of professional equipment falls outside the scope of Kodak Professional and Commercial Supplies.

The Kodak Professional Catalogue, of more than 200 pages, will be sent to any professional or commercial photographer on receipt of a request under business letter heading.

THE KODAK SERVICE

is based upon unique scientific and practical experience, and provides assistance in connection with every problem likely to be met with by the professional in the course of his work. Advice by experts in all branches of photography is freely offered on the lay-out and equipment of studios, on all technical questions, and on business management. Let us discuss your problems with you. Skilled demonstrators available to visit any part of the U.K. (apply Kodak House, W.C.2) and I.F.S. Elsewhere, enquiries should be addressed to the nearest Kodak House.

Kodak Professional and Commercial Supplies—continued.



Portrait by Mr. Howard King, Croydon Negative on Eastman Portrait Panchromatic Film

Kodak Photographs the World!

Kodak Photographs the World!

EASTMAN PROFESSIONAL FILMS

Whatever the subject or conditions of working, there is a negative material in the range of Eastman Professional Films which can be relied upon to give the finest possible reproduction.

EASTMAN PORTRAIT FILM

Par Speed and Super Speed. Par Speed is fast enough for normal portraiture, while Super Speed, which is much faster, enables very short exposures to be given.

EASTMAN PORTRAIT FILM HIGH SPEED ORTHO

A rapid film similar to Super Speed Portrait Film, and with a Matte *Anti Halo* backing which disappears in development. The reverse side is matted so as to be suitable for work with stump and pencil.

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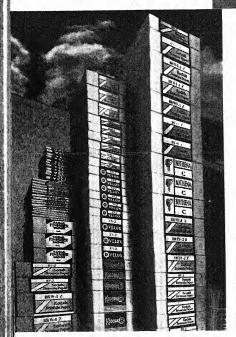
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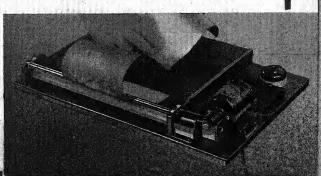
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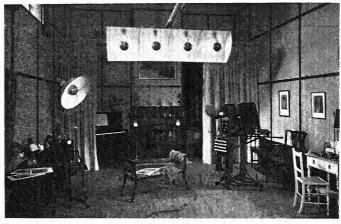
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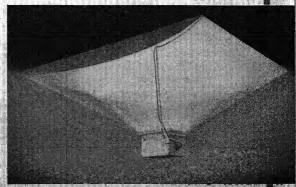
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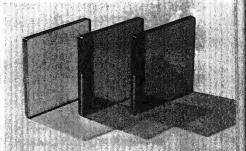
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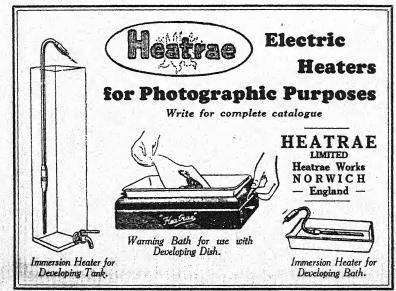
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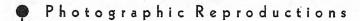
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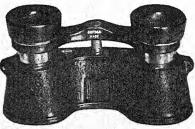
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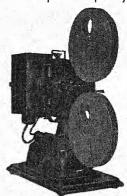
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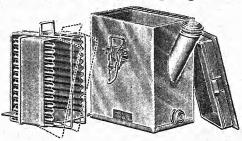
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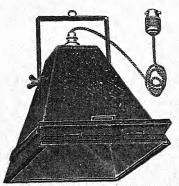
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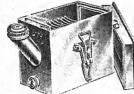
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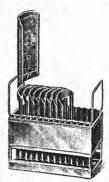
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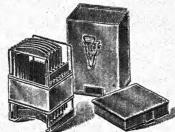
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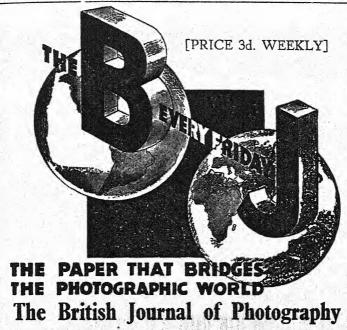
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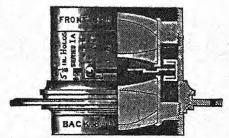
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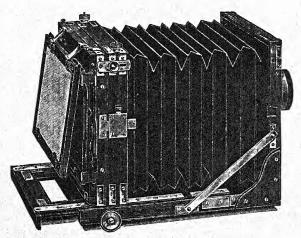
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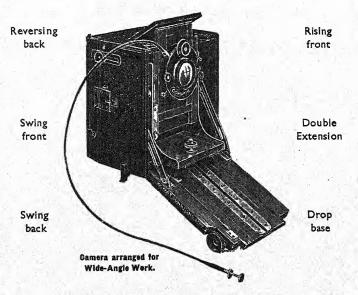
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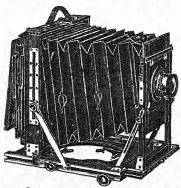
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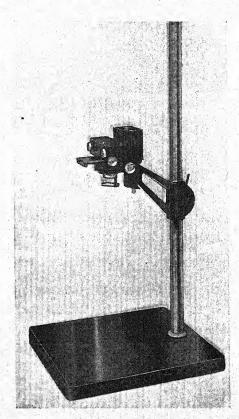
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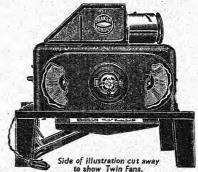
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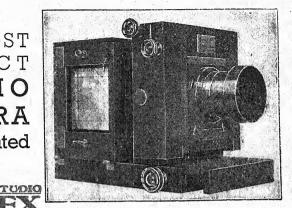
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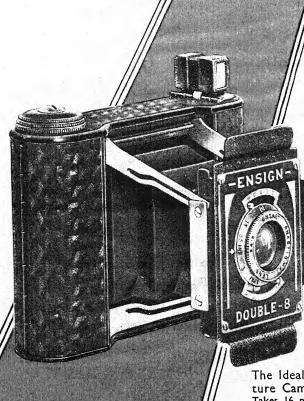
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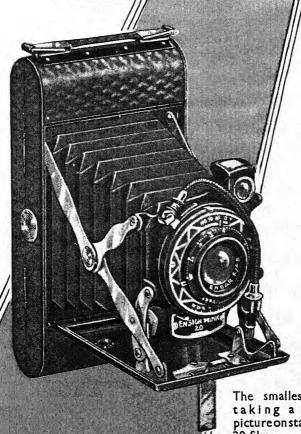
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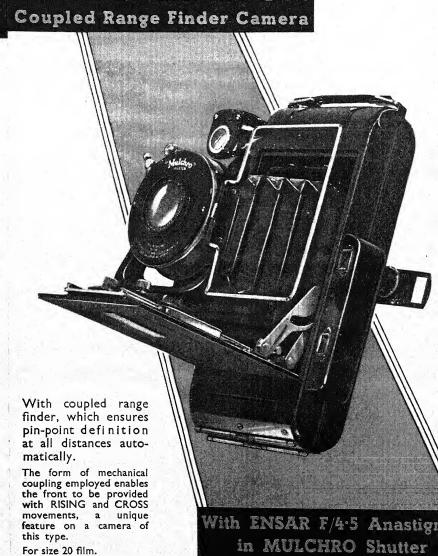
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| *ORDINARY | 100 |
| *†FINE GRAIN ORDINARY | 50 |
| †PROCESS (SPECIAL SERIES) | 15 |
| † Can be supplied as Dry Stripping Plates. | |
| | |

Barnet Plates

| 101 1 | 1 633 1 | HOLOR | rapily | | | |
|----------------|---------|---------|---------|--------|------|--|
| SUPER-PRESS | | | | | 1500 | |
| PRESS-ORTHO | | | | | 700 | |
| SOFT-PANCHR | OMA | ric | | | 700 | |
| * Also supplie | d in B | arnet 1 | 1att-En | nulsio | n. | |

Prices on Application.

ELLIOTT & SONS LTD., BARNET, ENCLAND

PLATES, PAPERS &



PLATES, PAPERS & FILMS



BARNET BARNET

Plates, Papers and Films Plates, Papers and Films

ALL BRITISH MANUFACTURE

Barnet Bromide Papers Standard Grades for general use

Single and Double Weight ...] Super Extra Vigorous Glossy. Extra Vigorous, Vigorous Normal and Soft MATT Single Weight Vigorous and Normal \ Matt. Double Weight

SEMI-MATT Single Weight

ENAMEL

Vigorous and Normal | Semi-Matt. Double Weight Vigorous, Normal and Soft

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Vigorous, Normal and Soft

Glossy. Contrasty, Contrasty, Normal and Soft

CREAM CRAYON Platino-Matt Smooth. Double Weight Natural Surface Smooth. Vigorous and Normal Semi-Matt.

Double Weight Platino-Matt Rough Normal Natural Surface Rough. PLATINO-MATT

Single and Double Weight ... Rough. Single and Double Weight ... Smooth. Normal and Vigorous ...

ORDINARY Single and Double Weight ... \ Rough and Normal Smooth. Single and Double Weight ... } Smooth. Vigorous

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(Continued)

REGAL ROUGH Surface. Double Weight Normal... White and Cream. MEDIUM ROUGH Double Weight Cream and Vigorous and Normal ... lvory White VELBRO Single Weight \ Velvet Vigorous and Normal ... \ (Pebble Grain)

LINEN GRAIN Double Weight Normal ... White and Cream. POST CARDS in all Grades.

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VERONA DE-LUXE

For Contact Prints and Enlargements. Yields a very rich warm brown-black colour by direct development. Also, if required, a wide range of pleasing warm tones can be obtained. Grades (all Double Weight)-

Cream Matt. Cream Silk-Lustre. Cream Smooth Natural. White Silk Lustre Cream Rough Natural. White Matt.

VERONA

A warm-tone paper of superb quality. Grades as follows :-"Standard" for Contact Prints-

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"Rapid" for Enlargements-Cream Smooth Natural. Cream Matt. Cream Rough Natural. White Matt. All Double Weight.

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Supplied in two Grades :--"NORMAL" ... Suitable for out-door photography. "RAPID" ... For Studio work.

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(Barnet Gaslight Paper)

A Gaslight Paper of great charm, clean working and reliable. Made in a variety of grades to suit negatives of any character, whether thin or hard in quality.

An ideal paper for Snapshot prints and highly recommended for

D. & P. WORK.

Supplied in the following Surfaces and Grades:—
GLOSSY... In Vigorous, Medium, Soft and
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For photomechanical work.

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|-----------------------|------|-----|--------|
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| ORDINARY | | ••• | 15 |
| ACECC | | ••• | 13 |
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| SENSICHROME ROLL F | ILM. | | W.S. 1 |

Prices on Application.

ELLIOTT & SONS LTD. BARNET, HERTS, ENGLAND

Telephone: Barnet 0011. Telegrams: "Elliott, Barnet." Cable Codes: Western Union & A B C 4th and 5th Editions.







FOR EXCELLENT

ENGRAVING PRINTING and PHOTOGRAVURE

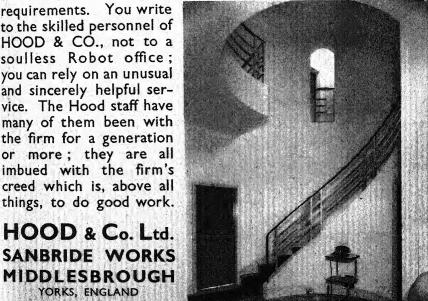
PRINCIPALS: HAROLD HOOD, F.R.P.S., AND CLEVELAND HOOD.

HOODS—A firm with years and years of practical experience in the production of ILLUSTRATIONS. In every department the finest machinery and instruments. Hoods are not so small as to prevent efficient handling of large contracts; nor so

large as to prevent adequate personal attention to intricate details of clients' requirements. You write to the skilled personnel of HOOD & CO., not to a soulless Robot office; you can rely on an unusual and sincerely helpful service. The Hood staff have many of them been with the firm for a generation or more; they are all imbued with the firm's creed which is, above all

HOOD & Co. Ltd. SANBRIDE WORKS MIDDLESBROUGH

YORKS, ENGLAND



FINE PRINTING

HOODS print Blocks remarkably, and also do delightful 'gravure. Send, on your trade heading, for some specimens and see for yourself Hoods are always glad to design suitable layouts for any work—folders, booklets, or for larger and heavier bookwork or catalogues. Hoods commercial artists specialize in brain-waves. Let us show what they can do for you! Booklets are our forte, especially of things which can be illustrated.

This advertisement is Hood Photogravure



If you have even a small piece of work to execute, write to Hoods; you will receive prompt and expert attention—we enjoy our work! Have you perhaps a distant idea such as: "I ought to issue a catalogue or price list of my own products"? Let Hoods give the idea a definite shape in the form of blank patterns and suggestions for general layout. The following are some of Hoods recent jobs:

Housing folders; Furniture catalogues; Die-stamped Stationery; Catalogues of hats, shoes, clothes, underclothes; Time Tables for Air Services; "Crossing the Line" Certificates for Ships; Share certificates; House Journals; Business cards; Tons of books for publishers; Hote tariffs; School brochures; Engineers table books; 3- and 4-colour pictures; Recording charts for various instruments; Unusual Personal Christmas Cards.

HOODS
Sanbride Works

MIDDLESBROUGH

ENGRAVING

Hoods main output:excellent Tone Blocks,
into which goes relentless care to ensure true
reproduction. They
cost no more than the
ordinary prices. Generous Trade Discounts
to Professional Photographers, Printers and
Publishers only. Hood
STANDARD TONE
BLOCKS for general

purposes where finest work is required. Included is the Patent Bevel-alone worth an extra discount; it relieves the machinist of one of the main troubles of printing. AUTOBLOCKS (Regd.) are cheap Blocks mass produced, intended for non-urgent work and for jobs which would not permit the cost of Standard blocks. Full details of this service are given in Hoods Block List; have you one? We also send free a practical Screen Chart which indicates clearly which grade of halftone screen is suitable for any paper.



PROMPT DESPATCH.—One customer said recently. "I wish to express my appreciation of the wonderful reproduction and promptness of delivery." (E.H.R.) Another: "Many thanks for doing the BLOCKS so quickly and well; my clients are very pleased." (C.D.) One more (a big firm): "We have had nothing even to approach these BLOCKS you have just made for us."

RETOUCHING. It is a mistake to imagine that with modern good photography there is no longer need to go in for "working-up." Mechanical subjects in particular may require much hand work or aerographing, or at least the removal of untidy backgrounds. Hoods do competent work in this direction,—send for specimens, please! Hoods often carry out wonderful work whereby poor photographs are

turned into startlingly satisfactoryones. This applies where there has been no alternative but to have a poor viewpoint for the camera.

HOODS PRODUCE:

COLOUR BLOCKS

2, 3 or 4 colour, from Pictures, Objects, Dufaycolors, or from uncoloured or Colour Photographs.

NEWSBLOCKS

Very rapid, reliable despatch.

STILTSBLOCKS

Really extra deep, with stilts-like dots, METAL MOUNTED. Will print on any kind of paper.

LINE BLOCKS

Reproducing line drawings.

Two or more colours if required.

DESIGNS

Retouching, Lettering, Artists work, Type-setting at very low prices for very excellent work.

PHOTOGRAPHY

A well equipped commercial studio where various goods may be photographed either small or in the grand manner

NAME & DOOR PLATES

In every suitable metal and every finish; large or very small.

HOODS Engravers
SANBRIDE WORKS Middlesbrough



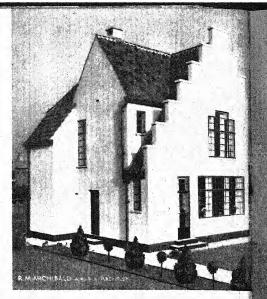
Hood Gravure

Is the process to use for any illustrated work where the finest possible reproduction is required. Particularly suitable for de luxe illustrations to books, and for anything of a specially important nature. Also prints well on quite common paper and therefore saves much cost for commercial illustrated work. Hoods now have arrangements to undertake quite small jobs in photogravure.

"We have received the 30,000 Cigarette Cards safely and to time. Many thanks for the splendid way in which you have carried out this work."

—B. T. Ltd.

HOOD POSTCARDS: Excellent work at competitive prices. Two main kinds: Photogravure cards and Block-printed cards. Much more economical than real photo cards especially for large quantities and when a number of subjects can be ordered at one time. Reprints are surprisingly



cheap and quick. You should see our samples! A few free, or generous batch 6d., please. Write for the Price List of either kind, For instance: A single Standard Postcard Block costs 14/8 and 1000 cards from it 17/6, Reprints from same block, 17/6 per 1000. (Reductions for several subjects worked together). Again for instance: In Gravure (no blocks used), printed from plate or cylinder, 1000 each of 12 cards, 28/7 per 1000; or reprints 17/6 per 1000.

HOODS, Sanbride Works, MIDDLESBROUGH



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Special packing
for
Tropical
Countries

cept no substitute.

Write for complete Catalogue.

"ADHERO" CAMBRIC AND MATT BORDER TINTS.

ese papers are coated on the back with our Dry Adhesive, so that it is y necessary to trin to the desired dimensions. They make a very unique and effective finish to any maunt. Sample free on application.

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Specially adapted for Dry Mounting.

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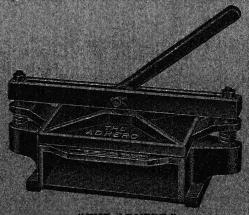
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"THE ADHERO"

The only machine for amateurs at the price giving even pressure over the whole of the surface of the print at one and the same time.

Those acquainted with the extreme value which may be attached to the Dry Mounting method coulddly admit that his apparatus brings the amateur in line with the professional as regards mounting.

The Dry Mounting method is most simple and effective.

The Adrieso machine will mount a bolate, 5 by 4, or a belief point on a mount up to 10 nucles wide in one pressure. Whole plate prints on 10 by 15 mounts in two pressures. Size of hearer plate 72 by 21, width between grust 105 inches.

PRICES

OUTFIT No. 1. for Gas beating, SSs. Od. complete 60s. Ud. ., 2, ,, Spirit ,, Electricity. 75s. 0d.

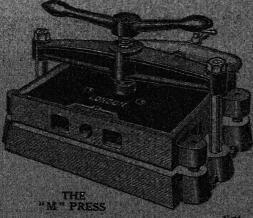
each Joint includes Accessories and One Packet of Adhesive Tissue Border Flats, and Mounts.

DRY MOUNTING MACHINE

THE "M" PRESS

A Dry Mounter for Amateurs and Professionals

This machine is suitable for amateur and professional photographers who go in for larger work than half-plate. It is the best value at the price.



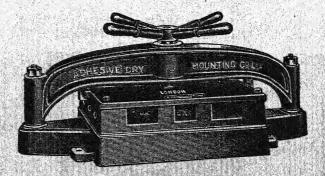
| | | | | Please. |
|---------------|-----------------|-------------|--------------|----------------------|
| | | PRICE. | | 土 5. 位, |
| deater | 1 by Gas | 404 | | 6 10 0 |
| Beales | l by Electrical | y | | 10 10 0 |
| Size of He | ated Plate 12 | by 8 in. V | Vidth betwee | n the Arms, 132 in. |
| Will mount pr | inta un to 12 1 | n tir. on a | mount 132 by | 10 in, in one pressu |

| Mounting Cover | Accessories a. mize 126 by 96 (| | | s, d. |
|-----------------------------------|------------------------------------|----------------------|-----------|----------|
| No. 1, Glazed | | | | each 1 a |
| No. 2. Matt Fixing Iron in V | Kood Handle II | 2000 2000 2000 | *** | 2 6 |
| Spirit Lamp for Gas Burner for | Heating Pixing I | ron | 100 Sept. | - 11 |
| | eter for Gas Mac | bines | | u 3 6 |
| | " Electric | Machines | | . 5.0 |

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The IMPROVED MODEL DRY MOUNTER "J" PRESS

Designed to meet the requirements of every Professional Photographer.

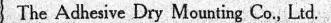


This new model Dry Mounter has a platen of 153 in, by 123 in, width between the arms 243 in, allowing of a mount to be inserted 243 in, full; a most convenient size for mounting 15 in, by 12 in, prints. Can be heated by gas or electricity. When ordering for electricity please state voltage.

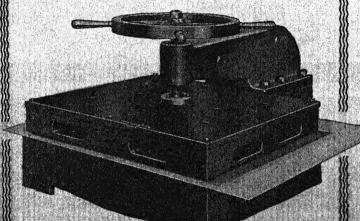
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Accessories for "I" Machine.
Mounting Covers, 46 by 13
No. 1, Glazed Surface, Zinc
No. 2, Matt...
Fixing Iron in Wood Handle
Cas Burner for Iron
Extra Thermometers
Electric Fixing Iron

... 7 6 ... 7 6 ... 7 6 ... 7 6 ... 5 0 Nett 12 6



DRY MOUNTING MACHINE THE "V" PRESS



PRICES.

Nett.

Heated by Gas ...

Size of Heated Plate

30 0 0 35 0 0

Will mount a print 20 by 24 in. on a mount 32 by 44 in. in one pressure, or a print 20 by 30 in. in two pressures.

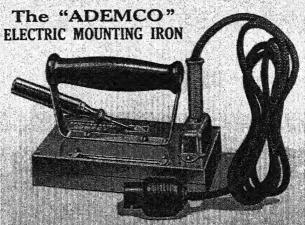
Accessories for "V" Machine.

Mounting Covers, size 22 by 26 in. No. 1, Glazed Zine ... No. 2, Matt Zinc ...

5. a. 2. 6 2. 6

Other Accessories same as "J" Press, see page 90

This machine is specially designed for large showcard work, and has the advantage of unlimited dimensions either side



PRICE, complete with Thermometer, Fixing Iron, Metal Plate, Mounting Tissue, Mounts and Times, packed in a convenient wooden box, together with 5 feet of flex.

WHEN ORDERING PLEASE STATE VOLTAGE.
COMPLETE 351.

ELECTRIC DRY MOUNTING FIXING IRON

Every Photographer using an Blectric Dry Mounter will find this iron a great advantage over the old method of heating the fixing from by gas or spirit. The consumption of current is exceedingly small, and is adapted for use on any voltage.

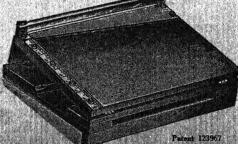
Please state voltage when ordering.



Price complete with 5 feet of flex, 12/6 nett.

MERRETT'S PATENT AUTOMATIC VISIBLE TRIMMER

The most efficient and practical Print Trimmer on the Market Will trim prints equal-ly well wet or dry



8½ in out (21 cm.) 10 ... (25 cm.) 122 ... (31 cm.)

15t in out (41 cm) 55 0 24 (60 cm.) 90 0 Larger sizes up to 54 in made to order.

THE NEW MERRETT MARGIN TRIMMER



This firmfilet Con-structed to serve a double purpose it can be used as an ordinary print immer, also converted into a Mar-gin Trun-fier, to tim

mareius from A to I

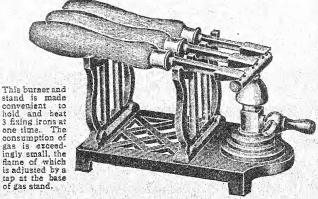
Price 251 17. 4.1

Made to out up to 8k m. larger sizes made to order.

Sole Agents for Merrett's Trammer, Margin Trimmers & Trimmeratis

The Adhesive Dry Mounting Co., Ltd.

NEW TRIPLE GAS BURNER AND HOLDER FOR FIXING IRONS



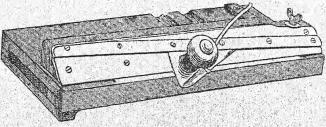
Price 10/6

Irons extra, 2/6 each.

THE "MERRETT" MOUNT BEVELLER

All British throughout.

For Hand Bevelling Photographic Mounts or Showcards.



Price

Made in the following sizes 10 in. 12 in. 15 in.

25 in. 80/-

18 in.

35/- 40/- 50/- 60/-Spare Knives for all sizes can be supplied.



Lollipop

Richard N. Haile, Bognor

ILFORD & SELO PLATES · PAPERS · FILMS

ILFORD LIMITED ILFORD LONDON



Relaxation Negative by Joan Craven Ilford Golden Iso-Zenith Plate

FITNESS FOR PURPOSE

A famous engineer said that the supreme test for survival was fitness for purpose. This general truth has been applied in particular by Ilford Limited to all its activities.

Consistent high quality and steady reliable progress have been the aim and achievement of Ilford Limited throughout its 56 years of existence and still continue to be the object of all its endeavours.

Sensitized photographic materials for any and every purpose are available from Ilford Limited in their most advanced degree of perfection.



A Matita Study Negative by Nocl Griggs. Studio Briggs Ilford Soft Gradation Panchromatic Plate

ILFORD PLATES & FILMS

for Professional and Commercial Photography

The Ilford series of Plates and Films for Professional and Commercial Photography represents a comprehensive selection of fast, medium and slow speed plates and films, all characterised by an unfailing high standard of quality, and all specially made to conform to professional and commercial requirements.

For brief details see overleaf.

<u>ILFORD LIMITED ILFORD LONDON</u>



Portrait Negative by Hocketts, Barnet Ilford Iso-Zenith Plate

ILFORD PLATES AND FILMS For Studio and Commercial Photography

| Golden Iso-Zenith | | | 1400 H. | & D. |
|---|--------------|-----------|---------------------------|------|
| Iso-Zenith (For high speed work indoors and out.) | | - | 700 H. | & D. |
| Zenith (Specially suitable for outdoor photography.) | | • | 650 H. | & D. |
| Iso-Record (A plate of high speed which is specially | suitable for | studio v | 500 H. vork.) | & D. |
| Portrait Film Hyperchromatic (Fast and orthochromatic. Equally suitable | for daylight | and arti | 1500 H. ficial lightin | & D. |
| Portrait Film Ortho Fast (Soft gradation, has great latitude and fre and anti-halo backed.) | edom from | fog. Orth | 700 H. ochromatic | & D. |

For details of all other ILFORD Plates and Films for Studio and Commercial Photography see the Ilford Price List of Plates, Papers, Films and Accessories.



Ascot Hat Negative by Dorothy Wilding Ilford Hyperchromatic Film

ILFORD PANCHROMATIC PLATES & FILMS

By far the most popular Panchromatic Plates and Films are those bearing the Ilford name. In every part of the world where fully colour sensitive materials are required the choice is always Ilford.

For scientific work, professional, commercial and amateur photography Ilford Panchromatic Plates and Films are supreme.

For brief details see overleaf.

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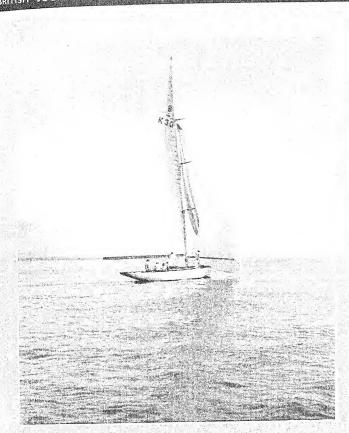
"Mr. Widgeon" for Burgoyne's (by courtesy of D. J. Keymer & Co.) Negative by Noel Griggs, Studio Briggs Ilford Soft Gradation Penchromatic Plate

ILFORD PANCHROMATIC PLATES AND FILMS

| Hypersensitive Panchromatic Plate 2500 H. & (Invaluable for all kinds of artificial light work.) |
|---|
| Soft Gradation Panchromatic Plate 700 H. & (Unrivalled for portraiture by artificial light. Combines high speed, soft gradation and great latitude with high colour sensitiveness.) |
| Special Rapid Panchromatic Plate 400 H. & (An ideal all-round Panchromatic Plate, extremely useful for general and copying purposes.) |
| Hypersensitive Panchromatic Film 2000 H. & (Invaluable for all kinds of artificial light work.) |
| Panchromatic Film 400 H & |

For details of all other ILFORD Panchromatic Plates and Films, see tilford Price List of Plates, Papers, Films and Accessories.

(A film of medium contrast, fully panchromatic.)



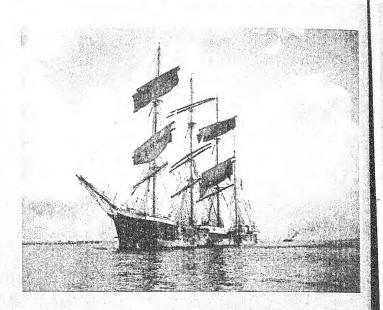
Balloon Spinnaker Negative by Charles E. Brown Selochrome Roll Film

ILFORD DOUBLE-X-PRESS AND PRESS ORTHO PLATES

The perfect plates for pressmen

These plates, which combine extreme fineness of grain, rapid developing and quick fixing and drying, are made in two speeds.

The Double-X-Press, 1500 H. & D., for winter work and for dull days and high-speed photography. The Press Ortho Plate, 700 H. & D., for high-speed work in normal light.



Windjammer Negative by "New York Times" Ilford Soft Gradation Panchromatic Plate

ILFORD PROCESS PLATES AND FILM

New process grades have been added during the past year to the already comprehensive series of Process Plates and Films made be Ilford Limited, and still further improvements have been made existing grades. All Hford Process Plates and Films are tested under everyday working conditions in the up-to-date Process Department allford, and all grades conform to the highest standard of quality before being passed for issue.

The Ilford Process Department is at the service of all Process Workers for any information or assistance.

For details see opposite page



Beauty in Action Negative by Charles E. Brown Ilford Hypersensitive Panchromatic Plate

Ilford Thin Film Half-Tone Plate

Coated with an emulsion of very fine grain and extreme contrast so that they produce results of the same quality as wet plates.

Speed 25 H & D.

Ilford Thin Film Half-Tone Panchromatic Plate - high contrast and highest panchromatic quality.

Speed 25 H. & D. high contrast and highest panchromatic quality.

llford Process Plate
The normal process emulsion giving great density, with clear high lights and ease of working.

Speed 100 H. & D.

Ilford Rapid Process Panchromatic Plate

Speed 100 H. & D.

The standard plate for three and four colour separation negatives for process block-making.

Speed 10 H. & D.

Coated with an emulsion of very fine grain and extreme contrast to give results comparable with wet plates with great ease and without the necessity for stripping.



Silver
(by courtesy of The Goldsmiths & Silversmiths Co.)
Negative by Alfred Craske, Ltd.
Ilford Soft Gradation Panchromatic Plate

ILFORD PLATES AND FILMS

For Scientific Work

During the past year considerable progress has been made in the manufacture of special grades of Ilford Plates and Films for scientific work, and although these grades are of little interest to general photographers they are in constant demand for scientific work.

A full list of Ilford materials specially manufactured to aid the scientist in his work is contained in the booklet, "Photography as an Aid to Scientific Work," which will be supplied on request.

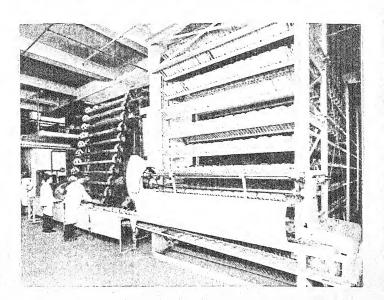
ILFORD LIMITED HEORD LONDON



Cornering
Negative by Star Photos
Ilford Double-X-Press Plate

ILFORD PHOTOGRAPHIC ACCESSORIES

Ilford Limited supply a complete range of accessories, including the Ilford Photo-Electric Meter; Exposure Calculators and Reckoners; Filters for landscape and general photography; Chromatic Filters; Filters for Photomicrography; Three-colour and Scientific work; Darkroom Lamps and Safelights; Developers, Sensitizers and Desensitizers. A full list of Ilford Accessories is contained in the Ilford Price List of Plates, Papers, Films and Accessories.



Bread Making
Negative by The Tella Co.
Ilford Soft Gradation Panchromatic Plate

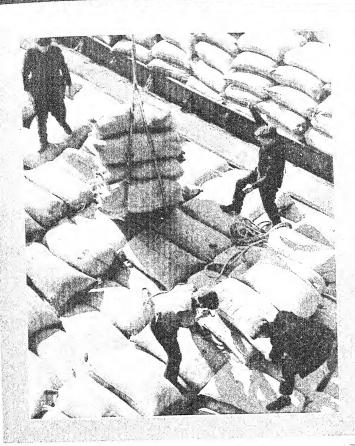
ILFORD BROMIDE PAPER

There is a grade of Ilford Bromide Paper for every photographic requirement, from the press photographer's print on glossy paper to the *de luxe* study of the portrait artist.

There is a wide variety of surfaces and tints, and almost every grade is made in three or more degrees of contrast.

Lustre is a new series issued during the past year, and will undoubtedly interest all professional and amateur photographers. In the Lustre series are twelve grades in cream and white with distinctive surfaces having a faint lustre or sheen which gives a soft brilliance to the finished print.

A complete list of Ilford Lustre Bromide and all grades of Ilford Bromide Paper will be found in the Ilford Price List of Plates, Papers, Films and Accessories.



Cargoes
Negative by Chaloner Woods, Curling Studios
Selo Hypersensitive Panchromatic Film Pack

ILFORD CLORONA PAPER

Ilford Clorona Paper is made specially for the portrait photographer and gives a wide variety of tones by development only. The range of tones is remarkable—from the normal colour, which resembles an old mezzotint engraving, rich and beautiful, to warm black, sepia and vivid red. Clorona is made in many tints and surfaces which are unsurpassed for texture and beauty of finish.



The Circus Engineer
Negative by Martin Sander
Ilford Soft Gradation Panchromatic Plate

SELO PAPER

Selo Paper is essentially the paper for printing from amateur negatives. It processes easily, quickly and well. It is uniform from batch to batch. It has generous latitude and is free from any tendency to stain.

Selo Paper may be used successfully with every type of drying and glazing machine, and will stand up satisfactorily to the heavy demands of rush periods.

Selo Rayon—a *de luxe* paper for artistic amateur prints—has a delicate cream base and a fine grain surface resembling artificial silk. It is of exceedingly fine quality and gradation.

Selo Paper and Selo Rayon Paper are supplied in packets for amateur use.

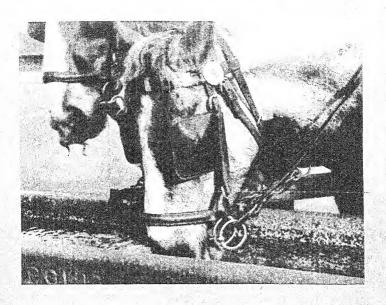


The New Midland Bank, Manchester Negative, by N. S. Kay, Manchester Ilford Special Rapid Panchromatic Plate

SELO Perfect Quality Roll Film

The introduction of three new Selo Films for miniature cameras, details of which are on page 112, makes the series of Selo Film a really comprehensive one. It can be truthfully stated that there is now a Selo Film for every size and make of camera, and that each film is the best which can be produced.

Film Packs are available in the Selochrome and Selo Hypersensitive Panchromatic grades.



Light Refreshment Negative by W. G. Briggs, Studio Briggs Selo Extra Fine Grain Panchromatic Film

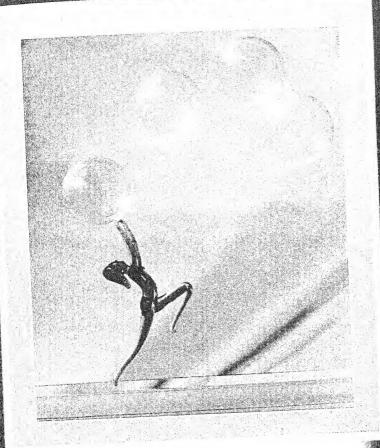
SELO ROLL FILMS

SELO—the fast roll film for all cameras and every photographic occasion. A fast film possessing great latitude.

SELOCHROME—extra fast roll film. Wholly dependable for all-round snapshotting. Multi-coated, highly orthochromatic and anti-halation backed. This film makes fast work easy under difficult conditions.

SELO Fine Grain Panchromatic Roll Film

Unequalled for the photographer who requires correct colour rendering with the advantages of a fast fine grain emulsion.



Ballerina Negative by Ernest Heimann Ilford Soft Gradation Panchromatic Plate

SELO Hypersensitive Panchromatic Roll Film

The fastest film made. Is completely and evenly colour sensitive. Makes instantaneous photography practical in dull light and by artificial illumination. For indoor photography with the Selo Lighting Set this film is unbeatable.

Full details of all Selo Films will be found in the Selo Film booklet post free on application.



An Amateur Snapshot on Selochrome Roll Film

SELO FINER FINE GRAIN FILMS

New Films for Miniature Cameras

The Selo range of Roll Films has been extended by the addition of three new fine grain films for miniature cameras. These new films have been introduced to meet the needs of users of Leica, Contax and similar cameras taking perforated film 35 mm. size. They represent the latest advance which has been made in the production of miniature films of the highest speed and finest grain.

The new Films are: --

Selochrome (Fine Grain Orthochromatic).

Selo F.P. Film (Extra Fine Grain Panchromatic).

Selo H.P. Film (Fine Grain Hypersensitive Panchromatic).

These films are supplied in the patent Selo Daylight-Loading Cassette and in unspooled lengths for darkroom loading.



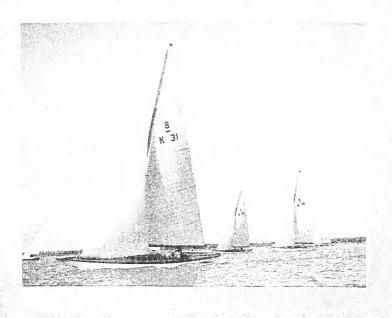
—And So To Bed Selo Hypersensitive Panchromatic Roll Film

SELO SAFETY CINE FILM

Selo Safety Ciné Film for amateur cinematographers is now supplied as reversal film in the 9.5 mm. and 16 mm. sizes in addition to 16 mm. Negative-Positive Film.

In all grades the emulsions are highly colour-sensitive, extremely fast and are of excellent gradation.

Full details of all grades are available from Ilford Limited, Ilford, London.



Lymington Regatta Negative by Charles E. Brown Selochtome Roll Film

DUFAYCOLOR ROLL FILMS AND FILM PACKS

The new Dufaycolor Process brings colour photography within the scope of amateur photographers.

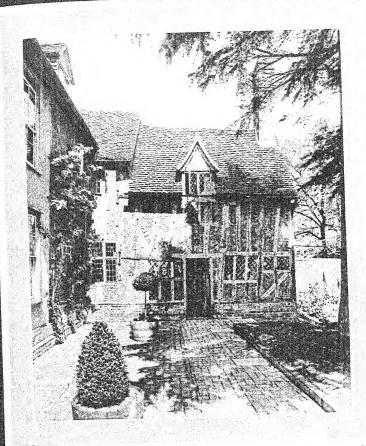
Duriyoolor Roll Films and Film Packs enable transparencies in beautiful natural colours to be produced easily and at comparatively low cost.

Dufaycolor is daylight-loaded into the camera in the ordinary way, and exposures are made without additional apparatus or filters.

Duraycolor is as simple to use as ordinary film.

Natural colour photography is also available for the amateur cinematographer using a 16 mm. camera. Dufaycolor 16 mm. Ciné Film is sold in 50 ft. and 100 ft. Daylight-Loading Spools. No additional attachments are required.

Interesting Dufaycolor literature is available from Ilford Limited.



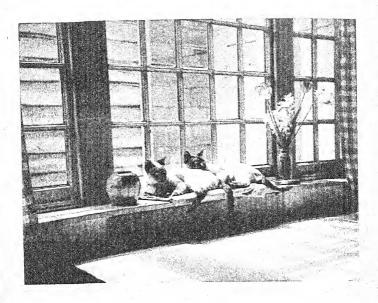
Tudor Gem Negative by Bedford Lemere & Co. Ilford Special Rapid Panchromatic Plate

ILFORD X-RAY FILM

(DOUBLE COATED)

Ilford X-Ray Film is coated with an emulsion which combines speed to X-Ray, speed to Intensifying Screens, excellent contrast, freedom from fog and quick fixing to a degree hitherto unknown.

The same film may be used with or without Intensifying Screens, and radiographs of excellent quality, full of detail, are obtainable.



Siamese Cats Selochrome Roll Film

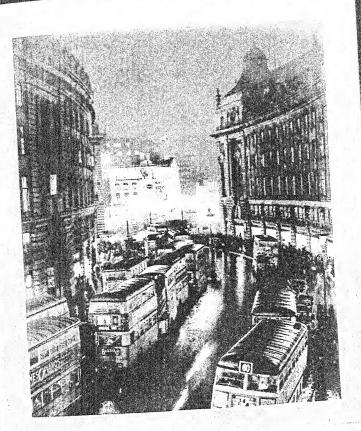
ILFORD X-RAY FILM

(DOUBLE COATED)

The greatest care is taken in the coating and preparation of the film to ensure complete freedom from mechanical defects, while the risk of abrasion is removed by the use of a super coating.

Ilford X-Ray Film is supplied on both nitrate and acetate bases; the latter is wholly cellulose acetate, thus giving the maximum security against fire risks. Normal films can be supplied and there is also available blue-tinted base in both the nitrate and the acetate varieties. This blue-tinted base can be supplied clear or translucent.

THEODIN LIMITED HEADIN LONDON



Regent Street
Negative by Express Photos, Ltd.
Ilford Hypersensitive Panchromatic Plate

ILFORD X-RAY FILM

(DOUBLE COATED)

The new "pearl" translucent film is preferable to matt as it combines the advantages of matt film with the ease of recognition of fine detail and small shadow differences usually associated with clear base.

GRADES OF ILFORD X-RAY FILM

Nitrate White Clear. Nitrate White Matt. Nitrate Blue Base Clear. Nitrate Blue Base Pearl.

Acetate (Safety) White Clear, Acetate (Safety) White Matt. Acetate (Safety) Blue Base Clear. Acetate (Safety) Blue Base Pearl.

ILFORD LIMITED

HEAD OFFICE: ILFORD, LONDON

Telephone: ILFORD 3000 (20 lines)
Telegrams: PLATES, PHONE, ILFORD

Codes:

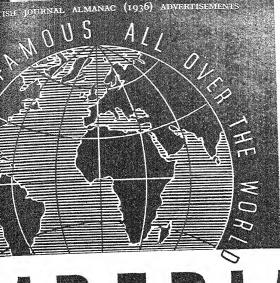
A.B.C. 4th, 5th & 6th Editions
Marconi International
Bentley's Complete Phrase Code
Bentley's Second Phrase Code
Ilford Limited "Private"

Factories:

Ilford Warley
Park Royal Watford
Mobberley Elstree

Agencies and Branches all over the world.





PLATES



IMPERIAL PLATES

have retained the confidence of photographers in all parts of the world for nearly half-a-century because of their exceptionally high quality, wonderful keeping properties and exemplary behaviour even under unfavourable conditions. Imperial Plates have characteristics which make them particularly valuable for every phase of photography—professional, process and amateur use—and can be depended upon to yield the best results it is possible to obtain.

A selection of the popular grades is given on the following page, but further details may be had on application.

IMPERIAL DRY PLATE CO. LTD.

IMPERIAL PLATES

| STUDIO, PRESS AND C | OMME | RCIAL | | | | and the same of |
|---------------------------|-------|-------|---------|--------|--------|--|
| PHOTOGRAPHY | | | | H. and | D. | Branco . |
| S.S.S. Press Ortho | | | | | 850 | The state of the s |
| Eclipse Ortho Soft | | | | | 850 | |
| Eclipse Soft | | | | | 850 | |
| Eclipse Ortho Soft | | | | | 650 | CONTRACTOR OF THE PARTY OF THE |
| | | | | | 650 | |
| Eclipse | • • • | | | | 650 | |
| PANCHROMATIC | | | | | | |
| Eclipse Panchromatic Soft | | | | | 850 | |
| | | | | | 400 | The state of the s |
| Panchromatic Process | | | ••• | • • • | 70 | • |
| PROCESS WORK, COP | VING | ETC | | | | |
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| Panchromatic Process | | • • • | • • • • | | | |
| Process | | • • • | • • • | ••• | 10-15 | |
| New Series Process | | • • • | ••• | | 45 | 2 |
| Fine Grain Ordinary | • • • | ••• | • • • | | 10-100 | |
| Ordinary | ••• | • • • | ••• | | 0-100 | I |
| AMATEUR PHOTOGRA | PHY | | | | | |
| Special Rapid | | | | | 250 | COMMON CO |
| Special Sensitive | | | | | 300 | |
| | | | | | 300 | |
| Non-Filter Ortho | | | | | 250 | |
| Non-Filter Ortho New | | | | | 450 | umin . |

ILFORD, LONDON, ENGLAND

Non-Filter Ortho New Series

IMPERIAL FILMS

FOR PROCESS WORK, COPYING, ETC.

These Films are especially manufactured for photomechanical work, copying, etc., and are of the utmost utility. They possess all the fine characteristics of Imperial Plates and will not fail to respond to all demands made upon them. They have been used by many of the leading Process Engravers and Commercial Houses with unfailing success for many years. The following is a list of Imperial Films. Further details will be supplied on application.

HARD PROCESS.

PROCESS NEW SERIES.

PROCESS E THIN BASE

*FINE GRAIN ORDINARY.

*ORDINARY.

Total Prince

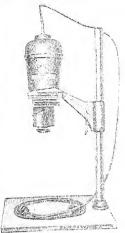
*These films can be supplied Matt to order.

IMPERIAL DRY PLATE CO. LTD.

ILFORD, LONDON, ENGLAND

Cable Address: "Impeople, London"

SANDS HUNTER & COLLET



"PRAXIDOS" VERTICAL ENLARGERS

For Miniature Negatives

"PRAXIDOS" O NON-AUTOMATIC

The Non-Automatic "Praxidos" can be set for any degree of enlargement by simply releasing a lever. The lamphouse is raised or lowered and is automatically locked in place when the desired size of enlargement is obtained. Focussing is completed by using the helical focusing mount of the lens.

The Various Types of Illumination

are interchangeable by one movement, e.g. opal lamps for projection lamps, opal screen for single or double condenser. This makes enlarging more varied in effect than contact printing. The illumination can be suited to the special qualities of a negative. All the finest details of a negative are revealed, and the amateur will find a wide field of interest when using a "Praxidos."



Wergiaten

GUTHE ATHORSCHE PARESDEN-A-BärensteinerStr. No. 8

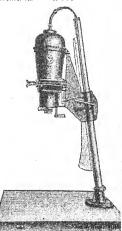
"PRAXIDOS" VERTICAL ENLARGERS "PRAXIDOS" AUTOMATIC ENLARGERS

With a "Praxidos" Automatic Vertical Enlarger the image, whatever size of enlargement is being made, is always in focus.

The Negative Carrier

The negative holder No. 530 is of unique construction. The pressure plates can readily be lifted whilst in place, allowing of the uncut length of film being quickly drawn through without any risk of scratches, and of the negatives being easily and exactly tested for effect. The negative holder No. 513 can conveniently be placed for enlarging any selected part of cut films or glass negatives. "Praxidos" Enlargers are made in 3 sizes, for 4×4 cm., 6×6 cm., 6.5×9 cm. or smaller negatives or portions of 9×12 cm. negatives.

Write for Price List to the Sole Distributors for Great Britain





THE "PATENT ETU!" CAMERA

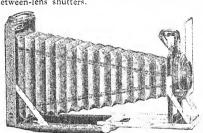
The thinnest and lightest of all cameras

Takes large pictures direct, yet is small, slim and light. T_{W0} movements only make it ready for use. On opening a Patent-Etui camera the lens front is as firm as a rock. This results from the special arrangement of struts. The exceptional rigidity of the baseboard is due to its peculiar convex shape, and it is a feature which allows of the unequalled slimness of the Patent-Etui camera. By using the very best materials and employing the finest workmanship, every part of the camera has been made both light in weight and handsome in appearance. The Patent-Etui camera will never be an incumbrance and is so reliable and certain in use as to be a source of infinite pleasure. Patent-Etui cameras are fitted with high grade anastigmat lenses in between-lens shutters.

 6.5×9 cm. $(3\frac{1}{2} \times 2\frac{1}{2}$ ins.) Weight, 11\frac{1}{2} \tag{0.5}, without lens and shutter. Outside dimensions, $\frac{4}{3} \times \frac{1}{2} \times \frac{1}{5}$ ins. Maximum extension (lens diaphragm to focussing screen), $7\frac{3}{4}$ ins. 9×12 cm. $(4\frac{1}{4} \times 3\frac{1}{4}$ ins.) Weight, $17\frac{1}{2}$ ozs., without lens and shutter.

Extension (lens diaphragm to focussing screen), 101 ins.

FOR PLATES, FILM PACKS AND ROLL FILMS



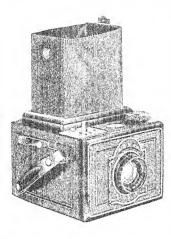
GUTHE ATHORSONS

* DRESDEN-A-Bärensteiner-Str.



JEKWEPSKOP

slides; it can also be used for projecting cigarette cards, postcards, small flat objects, book illustrations or colour prints of any kind. No special wiring is required for the Episkop -it may be used on any electric lighting circuit.





ROLL FILM REFLEX CAMERA

Equipped with tall hood, surface-silvered mirror and focussing screen of extra-fine ground glass, the "K.W." Reflex shows the subject as clearly and sharply as the most expensive reflex. The "K.W." Reflex is the smallest Roll Film Reflex Camera taking 34 × 24 in. roll film. It measures only $4\frac{2}{8} \times 3\frac{1}{8} \times 4\frac{5}{8}$ ins. and weighs approximately 31 ounces.

All-metal shutter, giving exposures 1/25th, 1:50th and 1/100th second, also Brief and Time exposures. Scales for stops and shutter speeds visible from above, thus ensuring rapid manipulation. Spirit level immediately over the lens. Steinheil f/4.5 Actinar anastigmat lens, in focussing mount. Also supplied with f/6.3 Anastigmat lens in focussing mount.



The "PILOT" REFLEX

The Smallest Reflex in the World

The "Pilot" Reflex measures only 5 × 21 XII ins. Gives 16 exposures on V.P. size film of any make. At the touch of a button the "Pilot" springs open to "infinity," the hood is automatically erected and the camera is ready for use. A simple lever movement changes the film.

Rapid focussing down to 3 ft. Magnifier over ground-glass screen for ultra-sharp focussing. Additional finder for upright eye-level pictures. Automatic exposure indicator. Supplied with high grade anastigmat lenses, f/2, f/3.5, f/4.5, in new style Rapid Compur shutter.



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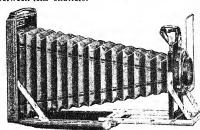
THE "PATENT ETUI" CAMERA

The thinnest and lightest of all cameras

Takes large pictures direct, yet is small, slim and light. T_{W0} movements only make it ready for use. On opening a Patent-Etui camera the lens front is as firm as a rock. This results from the special arrangement of struts. The exceptional rigidity of the baseboard is due to its peculiar convex shape, and it is a feature which allows of the unequalled slimness of the Patent-Etui camera. By using the very best materials and employing the finest workmanship, every part of the camera has been made both light in weight and handsome in appearance. The Patent-Etui camera will never be an incumbrance and is so reliable and certain in use as to be a source of infinite pleasure. Patent-Etui cameras are fitted with high grade anastigmat lenses in between-lens shutters.

6.5 \times 9 cm. $(3\frac{1}{2} \times 2\frac{1}{2} \text{ ins.})$ Weight, 11\frac{1}{2} ozs., without lens and shutter. Outside dimensions, $\frac{5}{8} \times 3\frac{1}{2} \times 5$ ins. Maximum extension (lens diaphragm to focussing screen), $7\frac{5}{8}$ ins. 9×12 cm. $(4\frac{1}{8} \times 3\frac{1}{8} \text{ ins.})$ Weight, 17\frac{1}{2} ozs., without lens and shutter. Extension (lens diaphragm to focussing screen), $70\frac{1}{8}$ ins.

FOR PLATES, FILM PACKS
AND ROLL FILMS





he KW EPSKOP Write for lists to the Sole Distributors for Great Britain The "K.W." Episkop is a wonderful new picture projector, specially designed for use in the home. It is mainly intended for projecting miniature size prints without having to make lantern slides; it can also be usedfor projecting cigarette cards, postcards, small flat objects, book illustrations or colour Episkop prints of any kind. No special wiring is re-quired for the Episkop it may be used on any electric lighting circuit.

37 Bedford Street.Strand, London, W.C.2

- SANDS HUNTER & CO.LTD





ROLL FILM REFLEX CAMERA

Equipped with tall hood, surface-silvered mirror and focussing screen of extra-fine ground glass, the "K.W." Reflex shows the subject as clearly and sharply as the most expensive reflex. The "K.W." Reflex is the smallest Roll Film Reflex Camera taking $3\frac{1}{4} \times 2\frac{1}{4}$ in. roll film. It measures only $4\frac{7}{8} \times 3\frac{1}{8} \times 4\frac{5}{8}$ ins. and weighs approximately 31 ounces.

All-metal shutter, giving exposures 1/25th, 1/50th and 1/10oth second, also Brief and Time exposures. Scales for stops and shutter speeds visible from above, thus ensuring rapid manipulation. Spirit level immediately over the lens. Steinheil f/4.5 Actinar anastigmat lens, in focussing mount. Also supplied with f/6.3 Anastigmat lens in focussing mount.



- Werkstätten

GUTHE &THORSCH & DRESDEN-A-Bärensteiner-Str.

No. 895

The "PILOT" REFLEX

The Smallest Reflex in the World

The "Pilot" Reflex measures only $5 \times 2\frac{1}{4}$ ins. Gives 16 exposures on V.P. size film of any make. At the touch of a button the "Pilot" springs open to "infinity," the hood is automatically erected and the camera is ready for use. A simple lever movement changes the film.

Rapid focussing down to 3 ft. Magnifier over ground-glass screen for ultra-sharp focussing. Additional finder for upright eye-level pictures. Automatic exposure indicator. Supplied with high grade anastigmat lenses, f/2, f/3.5, f/4.5, in new style Rapid Compur shutter.



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SANDS HUNTER & CO.LTD

stochrom.

"Optochrom" Light Filters are made of optical glass coloured throughout its entire mass during manufacture. They are not, therefore, affected by heat or damp, as are gelatine filters mounted between glass.

Optochrom Yellow Filters. Unsurpassed for orthochro-

matic material.

Density No. 0 (extra light). Exposure factor about 1½ times.

Density No. 1 (light). Exposure factor about 2 times.

Density No. 2 (medium). Exposure factor about 3 times.

Density No. 3 (deep). Exposure factor about 4 times.

Optochrom Universal Green Filters. (A new introduction.) Optochrom U.V. Filter. A special filter for mountain.)

Optochrom U.V. Filter. A special filter for mountain subjects

in conjunction with orthochromatic and panchromatic material, there is no appreciable increase in exposure.

Optochrom Reform Filter. A graduated filter of circular shape and steeply graduated from clear glass to deep yellow. Exposure

and steeply graduated filter. the same as without a filter. For correct colour rendering when Exposure factor

about 11 times.







Optochrom Red Filter. For distant views and exposures in misty weather. With panchromatic material the exposure factor is about 6-10 times.

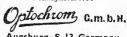
The Optochrom Red Filter is also suitable for use with Infra-red material. Exposure factor about 30 times Sets of Optochrom Filters, in case containing 4 filters and holder.

Set C. No. 1 Yellow, No. 2 Green, Blue and Red. For Leica (36 mm. diam.), Rolleiflex (28.5 mm. diam.) and Contax (27 mm. and 42 mm. diam.).

Sets of Optochrom Filters, in case containing 3 filters

Set A. 1 Optochrom Yellow Filter density 1 and 2, 1 U.V. Filter. Set B. I Optochrom Universal Green Filter, density 1 and 2; 1 Blue Filter. For Leica (36 mm. diam.). For Rolleiflex (28.5 mm. diam.). For Contax (27 mm. diam.). For Contax (42 mm. diam.).

Manufacturers:



Augsburg - S, 13. Germany Overseas Agents Wanted

Sole Agents for Great Britain Sands, Hunter & Co., Ltd. 37 Bedford Street, Strand, London



With Optochrom Filter



and holder.

Without a Filter

SANDS HUNTER & CO. LTD

"PRINSEN" ELECTRIC EXPOSURE METER



The "Prinsen" Electric Exposure Meter is the smallest exposure meter controlled by a photo-electric cellever produced. Its efficiency and accuracy are remarkable; due to the fact that the human element is eliminated, calcu-

lations are avoided and the reading depends entirely upon the actinic quality of the light itself.

chainty of the interest.

Carried easily in the vest pocket the "Prinsen" needs only one simple adjustment to the H. & D. speed of the plate or film in use. Then, with its lens presented at the subject to be photographed, it registers the correct exposure for any lens aperture instantly.

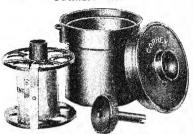
Price ... £3 3 0

Ever-ready Case ... 5/AKRISKOP' FOCUSSING MAGNIFIER



Simple to use and positive in results, the "Akriskop" all eliminates waste due to poor focussing with vertical and enlargers assures the best possible results from miniature negatives. It is accurate to a microscopic degree which cannot be attained by the unaided eye. Price £3 3 0

DEVELOP YOUR FILMS THE "CORREX" WAY



The "Correx" Roll Film Developing Tank represents the simplest, safest and most certain way of developing roll films and for panchromatic films, which must be developed in complete darkness, it is perfect. Any amateur using the "Correx" according to the simple instructions can be sure of properly developed negatives.

negatives.

"Correx" Roll Film Developer is available in packets containing just the right amount to make a developing solution to fill the tank. The "Correx" Thermometer is inserted through the lid of the tank and shows the temperature of the developing solution from the outside.

| | S. | d. | |
|--|----|-----|--|
| Io. 731. "Correx" Tank for V.P. films | 25 | 0 | |
| lo. 733. "Correx" Tank for 21 × 31 in. films | 25 | 0 | |
| Jo. 736. "Correx" Tank for 2 x 41in. films | 30 | . 0 | |
| Correx" Thermometer (Fahr.) | 2 | 6 | |
| 'Correx' Developing Powders, | | | |
| per carton of 6 pairs | 1 | 6 | |

THE "LEUDI" EXPOSURE METER

Less than half the size of an ordinary pocket lighter ! - the "Leudi" is easily the smallest and neatest exposure meter made. As simple as it is small, and as efficient as it is simple, it is the finest value in exposure meters ob-It is tainable.

tainable. It is as effective indoors as out of doors and can be used with plates or films of any make.

Price only 5/-

Purse Case 1/- extra.

SANDS HUNTER & CO. LTD

S.H. HOME PORTRAIT STAND The S.H. Home Portrait Stand has a centre pillar to which the three

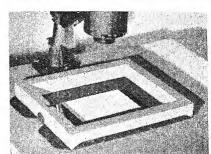
The S.H. Home Fortular Oranic mass a consecutive which the three legs are connected by adjustable supports.

The centre pillar can be raised or lowered without affecting the spread of the three legs. The stand has a Tilting and Rotating Top, enabling the user to point the camera in almost any direction without moving the stand.

Maximum Height, 60 ins.; Minimum Height, 30 ins. Weight, 8 lbs.

S.H. Home Portrait Stand ... Price £3 15 0

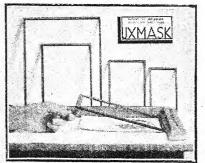
"GRAVURE" ENLARGING FRAME



The S.H. Gravure Enlarging Frame will give your photographs a unique distinctiveness, so that they will cease to be "just photos." It does not necessitate the use of special paper, but enables a variety of novel and extremely beautiful effects to be easily produced on ANY enlarging paper and with ANY vertical enlarger.

By means of the special textured translucent screens—which are non-inflammable—photographs can be made to have the appearance of being beautifully etched, or given "linen" or "tapestry" effects, to make them definitely "out of the ordinary."

Complete with 3 Screens and Masks, ½-Pl., I/I-Pl. and IOX8 in. ... Price £2 2 0



"LUXMASKS" MASKS

These are specially designed for use with Vertical Enlargers, and are the simplest and most efficient masking device. They consist of a heavy angle guide, $17\frac{1}{2} \times 12\frac{1}{2}$ ins., and five heavy masks, ranging from postcard size up to 12×10 ins.

The L shaped angle guide can easily be moved into any position on the enlarging table and when in the desired position the paper is then placed into the angle and the selected mask laid over it. These masks are bevelled on the inside to allow a clean cut white margin to be obtained.

With masks $5\frac{1}{2} \times 3\frac{1}{2}$ ins., $6\frac{1}{2} \times 4\frac{3}{4}$ ins., $8\frac{1}{2} \times 6\frac{1}{2}$ ins., 10×8 ins. and 12×10 ins.

Price complete £3 3 0

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BOOKS ON PHOTOGRAPHY

Filmcraft

By Adrian Brunel. An outline of the technique of film production.

3,6; postage 3d.

Film Technique
By Pudovkin. New edition of his classic work on film technique. 3 6; postage 3d.

Amateur Talking Pictures and Recording. By Bernard Brown, B.Sc. 76; postage 4d.

The Cine Camera By Herbert C. McKay, F.R.P.S. 6 -; postage 4d.

Cine Titling and Editing
By Herbert C. McKay, F.R.P.S. 6 -; postage 4d.

Cine Photography for Amateurs By J. H. Reyner. 188 pages; 76 illustrations. 10 6; postage 9d. Film-Play Production for Amateurs

5 -; postage 6d. By G. H. Sewell. Travel Photography with the Miniature Camera

Useful hints on selecting subjects.
2 6; postage 2d.

The Book of the Miniature Camera A practical exposition of miniature 2 6; postage 2d. cameras. The Miniature Negative: Its Development and Care

Many hints on developing.

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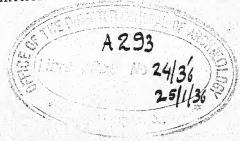
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THE YEAR BOOK OF PHOTOGRAPHY AND AMATEURS' GUIDE
AND THE PHOTOGRAPHIC ANNUAL.

1936

EDITED BY
HENRY W. BENNETT, F.R.P.S.
AND

ARTHUR J DALLADAY, A.Inst.P.



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ARCHITECTURE AND THE CAMERA

BY HENRY W. BENNETT, F.R.P.S.

Architecture as a subject for pictorial representation by photography possesses an irresistible charm. It makes a strong appeal to artistic amateurs but not to them alone. Distinguished portrait and technical photographers have felt its influence and have produced some of the finest archi-

tectural photographs ever seen at exhibitions.

The reasons for this are self-evident. The architecture is very beautiful in itself; it is ever varying in character owing to the individuality of design and treatment and the constant development of the character and style; and the form and colour are so softened and mellowed by the centuries which have elapsed since the finest buildings were constructed that their charm and their attractiveness as subjects for the camera . have become still greater. Let any lover of the beautiful and the picturesque compare any of these old buildings with the geometrical "modernist" structures which represent current architecture, and he will turn away from the latter in disgust. If these "modernist" buildings represented the best that modern architects could produce, this would not be an age of progress in architecture but an age of decadence. But, fortunately, they do not. There are still architects who can design fine and impressive buildings-buildings which will be the delight of photographers and all lovers of the artistic and beautiful in coming centuries.

There are two aspects of architectural photography. One is photographing the work purely as architecture, the other as pictorial photography in which the architecture only enters on account of its pictorial qualities or the aspect under which it is seen. In this latter type of work the architectural features are only secondary in interest; in the former, they are all important. The work included in the first type of architectural photography must not, however, be confused with purely record work. In this, a clear representation of architectural detail is of the first importance, but that aspect of architectural photography is foreign to this article. My object is rather to consider architecture as a subject for the camera as a pictorial representation of beautiful work. This is the manner in which

the photography of architecture should be regarded. The character of the work should be retained in the picture, and though pictorial quality and treatment are absolutely essential for a satisfactory rendering, the architecture is the vital subject of the picture.

These two types of architectural photography are illustrated in figures 1 and 2. The former, though certainly not a record photograph, is intended to illustrate the character of early Norman architecture. The latter presents work of the same character under a different aspect; the architecture, though still the subject is subordinated to the pictorial effect.

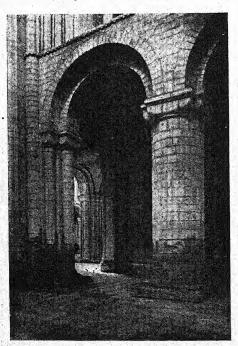


Fig. 1. In Ely Cathedral, 1090-1100.

Photographers who choose architecture will most instinctively select their subjects principally from the beautiful work of the five centuries following the Norman Conquest. With the coming of the Normans new ideals were introduced into the spirit of architecture in this country. A new seed was implanted ; it had already taken root France. and quickly found a congenial soil in England. new work that sprung from this seed developed rapidly, soon acquiring a national

character which distinguished it from contemporary work on the Continent, until the latest years of Gothic when English work differed essentially from that which had developed in other countries. The great majority of the buildings that have survived from that period are the churches and other ecclesiastical buildings: there are a few others but some of them are not so readily available for photography as the churches. It must be remembered, too, that all the finest architecture of the time was in the churches; in most cases the church dignitaries were the architects. They produced work which for originality and beauty in design, and also for skill in construction, has excited the wonder and the admiration of the finest men of our own times. And this is the work which photographers to-day can take as subjects for their pictures.

Fig. 2. Norman Massiveness and Strength, about 1120.

It is tempting material, it can be photo-graphed under very varying conditions of lighting so that different aspects can be represented in the resulting pictures.

Studying the lighting conditions is of the utmost importance in obtaining photographs of archite cture which shall be satisfying pictorially as well as presenting the architectural character. In interior work, quite as much as in exterior views,

the lighting effects change considerably. Under some conditions the architectural features are strongly emphasised; under others, they may be so subdued that their distinctive character is almost lost. No rules can be prescribed: each subject must be considered and studied independently and the

most striking or pleasing effect seized when it presents itself. Artistic judgment and love of the architecture will always be an infallible guide.

There is one respect in which the pictorial photographer will always in a different manner from those whose only aim is record photographs, and that is in selecting his point of view. For a satisfactory pictorial result, an oblique view should always be taken; the perspective effect is essential. A central or perfectly square front view of a doorway or screen might be desirable as a record of the work, but as a pictorial photograph of the architecture it would be an absolute failure. It may be regarded as an unvarying principle that some measure of obliquity is imperative for an artistic representation of architectural work.

There is another very important feature which demands serious attention, that is the foreground. It should be considered imperative that there should be sufficient foreground shown in front of the nearest vertical part of the subject to convey the impression of the space that would naturally exist between the subject and the observer. This foreground, and its treatment, are often neglected with serious results from the purely pictorial point of view. Occasionally there are attractive subjects in which neither floor nor ground of any kind can be included, and then, of course, this principle could not apply. A turret stairway, for example, is a subject that occurs to the mind instinctively, but in all cases where there is an actual foreground, it should not only be included to a liberal degree, but considered as an opportunity for effective treatment in enhancing the value of the lights and shades in the principal planes of the subject. In the majority of interior photographs the ground, and especially the foreground, will be far too light unless some measure of compensation is introduced to counteract it. In the majority of subjects the most simple form of control will be the most satisfactory remedy. By shading the greater part of the subject during printing or enlarging, the foreground may receive considerably more exposure than the principal features and a far more effective picture will result. Light masses on the ground, too near the base line of the print will be subdued, and lights within the picture will attain their due emphasis in consequence. This is a point which frequently receives far less attention than its importance demands. Concentrate the light within the picture, and that involves in most cases darkening the extreme foreground beyond the tone that it would show in an uncontrolled print,

All the skill in designing and in craftsmanship that the church builders possessed was devoted to rendering the principal churches, and to a lesser degree many of the smaller, the

finest that the period could produce.

It will be an advantage to direct the attention of architectural photographers to the character of the work of each century from the time of the Normans until the disappearance of Gothic architecture in the early part of the sixteenth century. But, in passing, a brief note may be added on the subject of Saxon work. There are still numerous examples of Saxon architecture

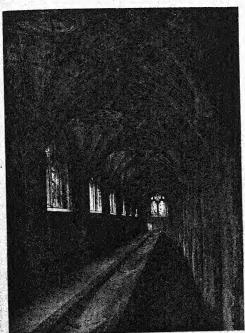


Fig. 3. Fan Tracery Vaulting, early 15th century.

country; Northamptonshire is specially rich. Most of them are only fragments, the greater part of the churches in which they are found having been re-built by the Normans. In many cases these fragments belong to the later period of Saxon ornamentation. There are, however, two or three churches almost entirely Saxon, one of them Brixworth, dating

in different parts of the

from the year 680, being a fine example.

It was, however, the coming of the Normans that effected the great change in the style, the character and size of the English churches. They brought with them a new style of architecture, and churches of far greater size and infinitely more impressive than any previously seen were commenced

throughout the country. During the twenty years following the incursion of the Normans many of our principal cathedrals were commenced as well as a large number of smaller churches. This is the work in which the architectural photographer will find many of his best and most effective subjects. The architecture was very simple and plain, bold and massive, and, for nearly twenty years, absolutely devoid of any attempt at ornamentation. The arches were formed of square blocks of stone without any mouldings. The illustration of the North Transept, Ely Cathedral, fig. 1, erected between 1090 and 1100, is a good example of the first period of Norman.

The early years of the twelfth century saw the dawn of decoration. It commenced in cutting simple mouldings in the blocks of stone forming the arches, and from this simple modification decoration was extended until the middle years of the twelfth century when rich decoration was added lavishly.

By the year 1175 Norman architecture had already commenced to show signs of a very distinct change. Working in stone had undergone very great developments during the century that had elapsed since the new builders had introduced their style and their methods. The beautiful decoration of their later work demonstrated this fact. The consequent refinement led to a new style, the First Pointed, or Early

English.

This style was well established in the very early years of the thirteenth century, and some of the finest that has ever been seen was completed about the year 1250. The chief characteristics are simplicity, lightness and gracefulness of form, with an almost entire absence of decoration excepting the beautiful mouldings of the arches and the equally fine column capitals. The arches were pointed, and the columns consisted almost always of a group of slender shafts clustered round a large central member. Beautiful as this work is, it offers far less opportunity for effective photography than the more robust and massive Norman buildings.

After the year 1260 decoration was introduced, sparingly at first, but more freely as extended opportunities presented themselves to the church builders. And, in the course of about forty years, the result was that more attention was being given to the decoration than to the actual form, and the gracefulness and simplicity of the Early English had given place to Decorated Gothic.

Decorated Gothic, like Norman and Early English, was steadily developed for about a century, during which time some very beautiful work was produced. The richness, delicacy and beauty of the ornamentation of this period have never been surpassed at any period in the history of architecture. But, unlike the preceding styles, there was no gradual transition to later work, but an abrupt change. That which followed Decorated Gothic allowed of no transition, the contrasts in method and treatment were too great. This change was due to the introduction of a new development while the Decorated style had not even reached its highest point; this new development being employed in a few churches only, concurrently with the general continuation of Decorated throughout England and France.



Fig. 4. The Latest Phase of Gothic, 1534.

This style arose from the desire of Abbot Wygmore and enrich beautify the architecture of plain and simple early Norman church Gloucester. This work being absolutely devoid of decoration, he conceived the plan of covering the walls and the arches with fine raised mouldings, principally in the form of panels, and a very great contrast to the bold and rugged work to which they were applied. Towards the end of the fourteenth century this was adopted as a new style of building,

and from the division of the work into panels by the series of straight lines at right angles to each other, it has been called the Perpendicular.

This style was continued in England until the end of Gothic architecture in the early part of the sixteenth century, but it

never found a home in France, though a few churches show its influence in their departure from the Flamboyant, the style that produced many beautiful examples of late Gothic in that country. In its earlier years, Perpendicular Gothic was very simple and severe, almost suggesting a reaction against the lavish ornamentation of the Decorated period. But throughout the latter part of its life, this style was very richly decorated, the ornamentation seeming to accentuate the basic forms of the architecture rather than conceal them as in many buildings of the Decorated period. Like the earliest Norman work, this fifteenth and early sixteenth century architecture offers many opportunities to the photographer, but his most impressive subjects will still be found in the work of the twelfth

Although some periods and some buildings may appeal to a photographer more than others, the whole of the work produced during the five centuries that Gothic architecture was running its course was extremely beautiful, and now that its forms and colour have been softened and mellowed by the hand of time there are innumerable subjects that offer fine material for picturesque rendering by photography. In many cases small village churches have provided subjects for attractive and effective pictures in the principal exhibitions, and there is still an inexhaustible wealth of material. The varying conditions under which an architectural fragment is seen, the suppression of some discordant feature by a certain condition of lighting, or the emphasis of some striking detail, or even the lighting effect alone, can all be utilised to produce a fine architectural photograph pictorially treated, or an attractive picture in which the architecture is less in evidence than the pictorial quality. The object of this contribution to the Almanac is to direct the attention of the newer generation of photographers to architecture as a subject for pictorial rendering, and also to remind them that it offers an almost inexhaustible supply of material of surpassing beauty.

SUBJECT CONTRAST AND GRADATION

By ARTHUR J. DALLADAY, A.Inst.P.

Much of the poor quality of work which nevertheless possesses the germs of high artistic merit is unquestionably due to an imperfect appreciation of, or inattention to the relations which should exist between the contrast in the subject,

exposure and development.

It is a significant fact that exposure meters and calculators are invariably based on the assumption that the exposure should be made dependent upon the contrast, or range of intensities, in the subject, whereas it is the development which this primarily affects. This state of affairs is in the main due to the complete non-existence, up to but a few years ago, of any exposure meter based upon the long established, and only sound principle: expose for the shadows. I think I am correct in saying that even to-day there is only one such meter on the market, and that the majority of photographers are unaware of its existence. Nevertheless the fact remains that correct photographic procedure demands that a measurement be made of the light reflected from the deepest shadow in the subject, another of the brightest high-light; that exposure be given in accordance with the former, and development in accordance with the latter. How many photographers apply, or even recognize, this fundamental law?

Apart from the paucity of suitable meters and the waywardness of photographers, there is the additional difficulty of the numerous widely differing types of emulsion now available, and the totally inadequate information furnished with them by the manufacturers, so that it becomes really necessary for the photographer to determine the characteristic curve for himself, or failing that, its equivalent in practice, which amounts simply to a hard-earned knowledge of what the emulsion will, and what it will not do, in the camera, and

—what is perhaps more—how to make it do it.

It may be argued that the latitude of the modern emulsion is such that, given reasonable exposure, standard development will give uniform results. This may be true of certain emulsions with long, straight characteristics, when used on subjects of limited variation of contrast; but it is emphatically not true when applied to everyday practice with a wide

range of materials of very different types used on everyday subjects of equally varied nature. The negatives obtained by giving exposures by meter of whatever type, and standard, or even controlled development cannot, even in the hands of an expert, be relied upon to give perfect prints on the particular grade of paper for which they are designed. It is a comparatively simple thing to judge an exposure, for an ordinary subject, to fall within the permissible latitude of a familiar plate, but it requires an expert of unusual order so to judge development that the contrast of the resulting negative will exactly fill the scale of gradation of his favourite paper, and give the utmost richness of which it is capable without risk of over-development and consequent loss of detail in the high-lights. There is accordingly a real need for some means of harnessing the contrast of the subject to the characteristic curve of the plate and applying a scientifically accurate schedule of development such that the final negative really does contain, within exactly those limits which are known to fill the scale of the paper-or, as will be discussed later, a predetermined proportion of it—the complete tonal range of the subject. Thus baldly stated, the problem would appear easy of solution, but in point of fact it is hedged around with difficulties. Roughly it can be divided into two parts-exposure and development—which can at first be treated more or less independently, and only combined at a later stage into a coherent scheme of procedure.

Exposure, which comes first in practice, is conveniently treated with first in this problem, and it will at once be realised that we are confronted with the task of measuring not only the brightness of the light but also the range of contrast in the subject as seen from the camera. There can be only one way of doing this, and I shall have to risk offending the many photographers who pin their faith to the sensitive tint actinometer by discarding once and for all the principle of measuring the light falling *upon* the subject. Sound and reliable as is this method, taken in conjunction with mature judgment as to the nature of the subject, it does not and cannot form the foundation of any systematic procedure which is designed to be independent of that human judgment.

There are two possible ways of measuring the light emitted or reflected by an object in any particular direction: the photo-electric cell and the visual photometer. For our purpose, in which it is necessary to measure accurately the brightness of individual small elements of the object, the photo-cell in its present state of development is useless, because it cannot be made so small as to be comparable in size with a small

image of the element in question. The visual photometer, on the other hand, whether of the Bell and Howell disappearing filament or some other type, performs this function admirably, and enables us to record an accurate value for the intrinsic brightness of any small element of the subject we wish to

photograph.

Now the problem of exposure, in round terms, is to ensure that sufficient light from the deepest shadow in which it is desired that any detail shall appear shall fall upon the plate to produce at least a perceptible image, whilst the light which simultaneously reaches the plate from the brightest highlights shall not exceed in intensity a certain multiple of the shadow intensity which is dependent upon the characteristic of the plate, and upon this alone. Obviously, we can only control both these factors simultaneously so long as the range of intensities in the subject does not exceed certain limits imposed by the plate. Where this limit is exceeded there are two alternatives—and two schools. One school upholds the rule: "Expose for the shadows," with the result that the gradation of the high-lights, which, as for instance in the case of a strongly lighted face in a dark-toned setting, is often all-important, is lost. The other school would expose for the high-lights, thereby consigning perhaps large areas of low tones to complete obscurity. In passing, it may be remarked that there is yet a third school which maintains that there is no such thing as correct exposure, and that the final picture is the outcome of inspired processing and cannot be anticipated at the time the exposure is made; this school has obviously no need for exposure meters and must therefore be left out of account in this discussion.

Since there can be no solution of the problem presented by excessive contrast in the subject, every attempt must be made to ensure that the wanted subject contrast does not exceed the range of gradation of the plate: this is above all important in colour photography, wherein the latitude is small to vanishing point. Apart from selection of the subject or its lighting, or adjustment of the latter where it is artificial and in the hands of the photographer, subject contrast cannot be controlled; but it can be measured, very accurately and con-

veniently, with the visual photometer.

The second part of our problem is that of development. Provided exposure has been correct and the subject contrast does not exceed the range of plate gradation, it should be possible so to control development that the resulting negative will possess just that scale of gradation which will suffice to fill the range of tones of the paper on which it is to be printed.

The gradation of the negative can be controlled, with more or less success, in several ways. Thus the plate can be developed by time and temperature, or by the Watkins factorial method, or by inspection, but in each case the contrast range of the

Fig. 1.

original subject, and the tonal scale of the printing paper, are two variables, both of which have simultaneously to be borne in mind, and it stands to reason that the success of the final result, even in the hands of the most experienced, is largely a matter of luck.

In the days of carbon and platinotype printing, the attainment of a negative of correct gradation was a deadly serious matter, for there was then one tonal scale, and one only, to choose from once the printing process was decided upon, as it usually was beforehand. Hence the popularity of-indeed the necessity for-intensifiers and reducers with which to retrieve failures. Nowadays, there are few failures, for the manufacturers have given us so wide a range of printing papers that it is a poor negative indeed for which a suitable grade cannot be found. Nevertheless, those who aspire to perfection still usually rely upon a favourite variety of paper-in many cases obtainable in one grade only-and for them the problem still exists in almost its original form.

It would seem, then, that the part of the problem which presents real difficulty is that of development, and the present paper is the result of an endeavour to combine a simple solution of the development problem with the use of an exposure meter so that two, or perhaps three simple observations at the time of exposure, and a simple calculator such as is incorporated on most exposure meters,

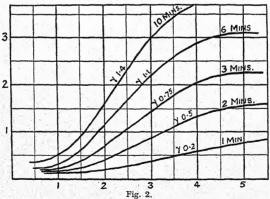
suffice to record and correlate all the factors which control the final result.

Fig. 1 will explain the principle of the calculator, although for obvious reasons it is not made flat in practice, but cylindrical. In the form in which it is shown in the diagram, the calculator is designed for one particular negative material for which the characteristic curves are shown in fig. 2 and for one developer, and one particular printing medium. slight modification, as will be explained later, is required if the calculator is to be used for a variety of sensitive materials. Constructionally, the calculator comprises five sliding scales. B is a scale of foot-lambert* meter readings, and may also conveniently bear a parallel fixed reference scale A of logarithmic intensities, although this is purely a matter of interest and does not affect the operation of the calculator. Slide D bears a pointer, d, which is set to the meter shadow reading, and also a development time scale. Slide E carries a pointer which is set to the meter high-light readings, and simultaneously indicates the development time. It will be noticed that the development time is now already fixed, irrespective of what exposure is finally given. This must be so, because the required gamma is dependent only on the range of contrast in the subject.

Now scale D also carries at its right-hand end a limit stop which limits the movement of the exposure scale F in one direction, whilst scale E carries a similar, left-hand stop limiting the movement of scale F in a left-hand direction. These two stops are so set that no freedom of movement is left to the exposure scale—i.e., there is no latitude of exposure —when the difference of log intensity in the subject (scale A) is equal to the logarithmic exposure range of the useful portion of the characteristic curve of the negative material. So long as latitude remains, scale F is free to slide along scale G, and any indicated exposure within this range is permissible. G is a diaphragm scale and carries the exposure pointer, which, as a refinement, may consist of a 70 pointer, corresponding to DIN speeds, assuming optimum development, with a short scale which automatically allows for reduced effective speed if development is not carried to this point.

* By foot-lambert is understood the intensity of light reflected in the direction of the observer by a white surface which is illuminated with an intensity of I foot-candle and which reflects diffusely the whole of the light that falls upon it. The scale is shown in the diagram in foot-lamberts for a better grasp of quantities and principles: in practice the readings are on a logarithmic or purely empirical scale.

The operation of the calculator is much simpler than its description might perhaps seem to suggest. The pointer H is first set, as with any exposure meter, to the stop which it is intended to use, by sliding the scale G. A meter reading is then taken on the deepest shadow which it is desired to render. and the pointer d set accordingly. If the calculator is to be used as an exposure meter only, and not as a means of development control, the exposure is then obtained directly by sliding the scale F as far as it will go to the right and reading off the exposure opposite the standard development time. full use of the calculator, however, for development control, a second meter reading is taken, on the brightest high-light. ignoring anything such as an exceptionally bright sky which it is afterwards intended to obliterate by double printing or as is sometimes inevitable, by shading, and ignoring also anything which it is proper to render as dead white. The pointer e on the slide E is then set to this value (reading across scale D to scale C: this can in practice be facilitated by the use of a transparent cursor bridging scale D, but such a refinement is unnecessary). The required development time is then read off from pointer e, and the exposure from the scale division g corresponding to the development time already read off from pointer e. In the diagram, the calculator has been adjusted



for a film with a characteristic as shown in fig 2, and a printing paper which gives full tonal range for a range of density in the negative of 1.2. A conservative value—1:250—has been taken for the latitude, discretion being exercised in those exceptional cases in which this latitude is exceeded.

The calculator is set for a subject whose shadow intensity is three foot-lamberts and high-light intensity 200—a decidedly high ratio of 70:1, which requires a development time of only about $2\frac{1}{2}$ minutes. The exposure may be anything from something under $\frac{1}{5}$ -sec., as indicated, to something over $\frac{1}{2}$ -sec., at $f/5\cdot6$.

For universal use, the development time scale D is replaced by a plain empirical scale, the limit stops and pointer H are made adjustable to suit the negative material, and the exposure scale g is also dispensed with and the pointer g adjusted to an average development value. Some such compromise is inevitable if undesirable complication is to be avoided in the universal form of the apparatus. An alternative method is to have a set of interchangeable rings for each material.

The whole scheme, as sketched above, is based on the principle of making the range of tones of the subject completely fill the paper from white to maximum black. This, however, is often unnecessary, and even objectionable. In most actual scenes of fairly strong contrast, there is some area which appears so dark that not only is no detail discernible in it, but it is possible, and even desirable, to render it by the blackest tone which the paper is capable of producing. This is, however, far from being generally the case. At the other extreme, for instance, can be cited a scene of trees in mist, with nothing darker than a light grey, in which the use of the full tonal scale of the paper is unthinkable. How, then, are we to modify our scheme to fit the requirements of actual practice? To arrive at an understanding of the principle involved, we must go back and consider what is the meaning of black as an ordinary visual impression.

In the first place, the apparent depth of a shadow is not in the least represented by the intensity of light reflected from it as measured by a meter. An object which appears in daylight as a deep black shadow may, if illuminated at night with the same intensity (and therefore giving the same meter reading) appear as a high-light, owing to the "dark" accommodation, or increased sensitivity of the eye when accustomed to comparative darkness for some time. Briefly, the eye judges the depth of a shadow in relation to the total volume of light which enters the pupil. An obvious way, then, of measuring the visual shadow impression, and therefore the depth to be aimed at in the shadows of the final print, is to compare the intensity of light reflected by the shadow against a grey scale illumined by the subject as a whole. This, fortunately, is an easy thing to do, and the result gives a figure which represents the depth of the shadows in the final print, or, in 150

terms of our development scheme, the proportion of the full, meter-indicated, development which the 'key' of the subject requires. The only modification to our apparatus is the addition of a second comparison field, adjacent to that used for high-light and shadow meter readings, but illumined, through a variable density wedge, by the aggregate light reflected by the subject as a whole; and the only addition to our procedure is, after taking our shadow reading, to match the two comparison areas by rotating the wedge—the work of The reading is merely noted, and used, at the time of development, to modify the indicated development time. As an illustration of the manner in which this grey scale reading works, let us imagine two subjects. One is a contrasty daylight scene with an average illumination of 400 foot-lamberts with shadows of 20 foot-lamberts which appear to all intents and purposes black to the eye. The other is a relatively high key subject under average artificial studio lighting with an average illumination of 50 foot candles and the same minimum intensity. The minimum, or shadow meter reading will be identical in the two cases, but the grey scale reading in the one case will be at one end of the scale. calling for the full development time given by the calculator, so as to fill the tonal scale of the paper and give black shadows, whilst in the other case the grey scale reading, representing a relatively high tone, will be well towards the other end of the scale, calling for only a fraction of the development time indicated on the basis of full tonal rendering.

It is not within the scope of this paper to describe in detail how it is possible to construct apparatus which will apply these principles in practice with the greatest simplicity and convenience. Its purpose is, in the first place, to awaken an interest in the purely abstract principles upon which the scheme is based-principles which can to some small extent be applied without the use of any instrument other than a reliable visual photometer. In the second place it is designed to emphasize the need for more attention to be paid, firstly by manufacturers of exposure meters to the demand on the part of the more serious worker for a discriminating meter, in contradistinction to the popular photo-electric integrating type; and on the other hand by the manufacturers of sensitive material to the demand for more information to be issued with such material; a family of characteristic curves, which need only be broadly typical of the average behaviour of the material, should be issued with every package, and will give the user all he wishes to know (with the exception of colour

development conditions, and latitude.

Radio has proved that the public very quickly acquires a sense of the practical significance of technical data and curves the scientific bases of which are entirely beyond their comprehension. Manufacturers were quick to turn this to account and use such data—and curves—as a sales argument. I believe the same thing would hold good in the photographic industry, for a film characteristic holds no more magic than a valve characteristic. If these curves were issued with the goods, even, at first, on the part of a few manufacturers only, the necessity for finding some compromise solution of the speed number problem would, I am convinced, disappear.

Innumerable developments and side issues have arisen during the course of these investigations, and many objections, foreseen and unforeseen, certainly exist; the whole scheme as sketched will often prove to be but a foundation on which to base a modified procedure. It is, however, felt that this whole aspect of the control of the final gradation of the negative is worthy of far more consideration than it at present receives, and it is hoped that this paper may provide some little

stimulation in this direction.

THE PHOTOGRAPHER AND THE PAINTER

By D. C. ROWLETT.

The proper relationship of photography to the great family of the graphic arts has been argued, without hope of finality but with undiminished vigour, since photographs first existed. The argument has not been eased by the fact that many painters who have made *ex cathedra* statements on the subject have had little or no knowledge of photography, while the photographers have often displayed an equally lamentable

ignorance of the basic principles of artistic practice.

One difficulty is the lack of a common ground as to what. if anything, really constitutes "art." In modern times there has grown up a tendency to confine the use of the word within far narrower limits than would once have been allowable. The great artists of older days were quite often architects and sculptors as well as painters. Nor did they consider it beneath their dignity to turn out a pair of wrought-iron gates, a silver chalice, or a piece of carved scroll-work, on the side. To-day a large part of such minor activities would unhesitatingly be classed among the crafts rather than the arts. We have created such a chasm between fine and applied art that by slow degrees we have come to consider that the latter is really hardly art at all, except by courtesy. Art to us means painting, sculpture, or the architecture of great public buildings: all else is just craftsmanship, something taught at trade schools and welfare centres. But the distinction is almost entirely a modern one. The great masters of the past did in truth regard themselves primarily and essentially as craftsmen. Art, to them, was something inside a man which, if he had it, must necessarily order and control all the work of his hands. It was not a possession to be taken out and analysed, but to be fed. And its food was knowledge and yet more knowledge, the knowledge of that beauty which is truth.

Looked at in this broad and perhaps primitive sense, anything wrought in complete sympathy with its materials, and fulfilling simply and adequately the object for which it was made, can be art. It depends only on whether the man who wrought it was an artist. A wooden chair may be a work of art if it obeys these two simple rules. That is to say it must be made within the natural limits imposed by the material,

must be in essence a piece of woodwork, violating none of the limitations which wood sets up for itself, and beyond this it must be a good chair, comfortable to sit on, stable and firm and not easily upset. If it is all these things it quite sure at least to be a pleasing chair to look at. Whether it is that something more which makes a work of art depends on whether it was made by an artist.

This was the old idea of art. Faithful and conscientious craftsmanship, glorified by some mystic, magic quality which came from within. To some the gift was granted in greater degree, but it was the duty of all good craftsmen so to order the work of their hands that whatever modicum of art might reside in them would not be imprisoned, but remain free to express itself through whatever material they might use. They saw no essential difference between the chased or hammered design which ornamented a silver wine-flagon, and a painting in oil or tempera intended equally to beautify the wall on which it hung. They saw, at least, no difference in kind but only of degree.

Nowadays we have forgotten all this. For which reason we have silly little tables that wobble and fall over, furniture with drawers that stick, and tea-pots that dribble when we pour out. And what is perhaps even worse, we have cement pretending to be carved stone, interesting new materials such as bakelite masquerading as walnut, tortoiseshell or marble, and wall-papers not content to be paper, but taking on the appearance of wood or leather. And sometimes also we find photographs ashamed of photography, and going to any

lengths to deny their origin.

All of which means that we are losing that respect for our materials which is the basis of true craftsmanship. Every material must have its natural means of expression, predetermined by its nature, and photography is no exception. It is sometimes argued that because a camera is a mechanical instrument it must necessarily fail as a medium for the expression of art in any form. But, to use a musical analogy, a concert organ is at least as complicated a mechanical instrument as is a camera, yet a musician finds the mechanics no insuperable bar to the production of music. A camera and a roll of film are no more, and no less, artistic in themselves than are the pigments, brushes, and canvas of the painter. What the artist can do with them is the thing that matters in both cases. The instruments of art must always pertain to the mechanical. The brush of the painter, the needle of the etcher, the chisel or gouge of the woodcarver, all are machines in a greater or less degree.

Yet we are told that because of the mechanical taint a photographer cannot fully express himself in his work, as can What exactly this "expressing himself" really the painter. means is not made very clear. Presumably it indicates the ability to show originality or individuality in the finished work. A visit to any photographic exhibition, where Andersons and McKissacks, Keighleys and Macdonalds, can be recognized on sight as easily as the works of Lavery, Sickert and John in another sphere, will soon show that this power is not the sole prerogative of the painter.

And, in any case, do we not pay too much homage to this desire for self-expression in artistic matters? Any artist who intentionally sets out to express his own personality in his work is a bad artist. If he has any individuality, it will, without any striving on his part, show in and through all he does. willy nilly, and he deserves no special commendation for it.

What has essentially to be expressed is not so much ourselves as our subject and all that it implies. If we give the subject its fullest expression we are bound also to express our own reactions to, and ideas about, that subject. We quite simply

cannot help it.

Photography then, considered as an artistic or pictorial vehicle, must be judged solely according to the degree in which it allows the artist untrammelled freedom in the full statement of his subject or theme in graphic form. The photographer possesses this freedom, to a greater extent even than the painter, only so long as he confines himself to the realm of fact, to the delineation of the actual. He ceases to have complete freedom when he steps over the frontier into the land of invention and

fancy.

The highest expression of art is, and must always remain, creative in its essence; a borrowing of the forms of nature to make out of them a new thing. The photographer can recreate nature most marvellously, but he cannot pass on to us any fact which did not previously exist. He cannot create in the concrete, cannot produce things and people which had no being till he breathed life into them. In the realms of the abstract alone can he sometimes be a creator, that is to say he may, out of light and shade, tone and gradation, conjure up a mood or a feeling that had no existence in the facts of the subject but came out of his own artistic inspiration. Photography as a medium of art must rely on its unrivalled ability to re-create actualities, and, through the faithfulness of its re-creation, to convey an abstract mood or impression. And here it parts company with painting whose chief concern is not, or at least ought not to be, with these things. The

painter's business is to use nature for his own invention.

Painting and photography, if both would only bring themselves to realise it, ought not to be competitors at all. They have it in common that each is a graphic medium, amenable to the same principles of pictorial construction, balance, and tone values. But beyond this there should be no similarity in their aims and intentions. They should move, each to legitimate pictorial ends, along parallel, and not intersecting, paths. The ability of photography to convey actuality with such superb and almost contemptuous ease has, if the painters would but believe it, released them once and for all from any necessity to do likewise, freed them from the shackles of the real and left them at full liberty to concentrate upon the ideal. But too many of them have not yet grasped at this new freedom. The type of painting we call "photographic" should be dead, but it still exists, a pathetic survival from the days when there was no photography to do it so much more easily and efficiently. It survives to-day in a slightly different form, it is true. Realising, in a dim sort of way, that it must show the ability to do something that the photographer cannot, it has taken the easy way out by an exploitation of the painter's technique to its utmost limits, hoping perhaps that the bravura of its brush-work or knife-work may serve to hide the sorry lack of all creative impulse.

Nor is the photographer always blameless. The manhandling and handwork to which some negatives and prints are subjected is immoral not so much because it is a mixture of two mediums as because it is a mixture of two motives, an attempt to add a veneer of invention to a basis of actuality. It is a sign of bad craftsmanship, a confession of failure to express what had to be said within the bounds of photography.

All this does not mean that photography must confine itself to prose. There are almost no limits to the wealth of poetry and imagination which can be conjured up by the real, if, paradoxically, it is only real enough. Realism is the photographer's doorway to romance, invention the painter's. Here there is no competition. Each is free to work, to the best of his ability, to his own ends and purposes, the one pursuing his vision of the ideal and the other seeking the no less elusive beauty of the real. More than one road can lead to Rome, and art may be served by the faithful portrayal of simple things with understanding and insight as well as by the towering imagination of the great creative artist.

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PHOTOGRAPHIC SHUTTERS

By E. A. SALT.

In all its aspects the subject of "Photographic Shutters" is a very large one indeed, and the difficulty of presenting anything like a comprehensive review within the compass of an article of reasonable length has necessitated much compression of matter, and the omission of any reference to many interesting shutters of the past. This by the way of apologetic

preface.

Starting with the prototypes of modern central-opening diaphragm shutters, capable of being fitted to roll-film and other small cameras, these appeared on the market some 40 years ago so far as can be remembered, represented by Bausch & Lomb's double-bladed "Unicum," which achieved great popularity. It had a range of pneumatically-controlled speeds marked 1 to 1/100 second, and was followed by the triple-bladed "Automat," and other models built on much the same lines, but which required no separate setting, the lever compressing the spring during its passage to the release point. This feature is embodied in many present-day shutters, but is of doubtful advantage as the longer travel of the lever, usually found, increases the liability to shake at the moment of exposure.

Many thousands of these shutters must have been sold, and doubtless a large number are still in use to-day, and here a word of warning may be uttered, for the very thin vulcanite blades sometimes fitted are by no means opaque to red light, which can be tested by directing the camera toward the

unobscured sun and peering through the back.

As a matter of fact the "Unicum" was an extremely ingenious shutter, but possessed a fundamental defect in design, for in order to obtain the maximum velocity of the blades they were pivoted so close to the thrust, that any deposit of dust or damp on them exercised a strong leverage against the weak spring employed, which, combined with another feature presently to be touched upon, tended to uncertainty of action. Nevertheless, it was a trim little person which never "talked," and despite its vagaries is remembered not without affection.

To this period must be attributed the introduction of overstating the top speed, and so universal became the custom that later manufacturers of mass-production shutters were, more or less, compelled to follow it or else crab sales at the start. Seldom did the marked "1/100" rise above 1/50 sec., and often sank below this figure as tests have indicated.

The "Multi-Speed" of American origin, and supplied by Ross and Company in 1910, deserves notice as it struck a new note in shutter design, for the blades were pivoted on their axes midway along their length, thus imparting a continuous rotary movement instead of the customary reversal at full opening. Speed adjustments were, however, troublesome to make, and the shutter, so far as is known, is not now on the market. The top speed was marked 1/1,000.

VARIOUS TYPES.

Shutters may be arbitrarily divided into three broad groups, the first, let us say, being represented by those that work immediately in front of, or behind the lens. The Thornton Pickard roller-blind shutter, with its really clever yet simple "time and instantaneous" device will be familiar to all. It has done much good work in the past, and is capable of repeating it in the future. Studio shutters also fall within this category, though they are almost universally employed behind the lens where their operation will not attract the attention of the sitter.

Diaphragm shutters can be placed in the second group, and focal-plane in the third, both of which will be dealt with later. But it can be remarked in passing that the diaphragm is the ideal position for the shutter blades to occupy, as there the aperture to be uncovered is at a minimum, and the moving parts can be correspondingly reduced in size and weight; also every point on the plate is illuminated simultaneously.

Williamson's beautifully made "Louvre" shutter, used behind the lens in their aircraft cameras, occupies a position of its own. Its essential feature consists of very thin steel strips or slats arranged in venetian-blind fashion, which, on opening, reverse after traversing an angle of 90°, and then close. A range of speeds from 1/50 to 1/300 second, it is stated, can be secured. They are controlled by an inertia wheel, which only comes into play when the strips are in the fully-open position. The maximum efficiency (claimed to be inherently high) possible with this interesting type is thus realised.

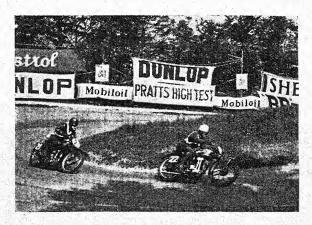
The chief application is for lenses of wide aperture and long focal-length, as usually employed in aerial photography, but it has also been adapted to a smaller aircraft and general utility "Pistol" camera. Owing to the rapid motion of the aeroplane, a focal-plane shutter would introduce distortion

in the scene photographed, ruling it out of court for accurate survey work. None, of course, is introduced by the "Louvre."

EFFICIENCY.

Though it may seem rather like "putting the cart in front of the horse," to introduce the question of efficiency at this stage, it is thought desirable to do so by way of "clearing the air," as it has an important bearing on much that follows.

To take one concrete case by way of illustration. Many years ago a diaphragm shutter was on the market which opened and closed in true iris (circular) fashion. If the diaphragm was set to, say, f/8, and the speed dial to 1 second, on release the blades slowly opened to this aperture, and, without pause as slowly closed again. At faster speeds the blades proportionately accelerated.



Speed 25 miles per hour: Exposure 315 second. Camera still.

A pretty shutter to watch, but one of the least efficient that could be designed, for the blades in the act of opening and closing (assuming constant rate of travel) obstructed no less than two-thirds of the light that would have reached the plate if they had opened really instantaneously, remained open to the aperture set for the full 1 second, and then closed in no time. Self-evidently this is a purely imaginary conception, but it represents the ideal 100 per cent. efficiency, with which all shutters are compared. Clearly then, the light efficiency of the iris shutter was but one third, or 33½ per cent.

The duration of exposure, that is the period between the first opening and final closing of the blades, was 1 second certainly, but the effective exposure 1/3 second only. Or expressed in another way, the hypothetical ideal shutter in 1/3 second would have given to the plate or film the same exposure as the iris shutter afforded in 1 second.

It will be of assistance to clear thinking, if the expression "duration of exposure," generally covered by the rather indefinite term "speeds," be always thought of as mainly relating to an interval of time and having no fixed relationship to the amount of light transmitted by the lens, as is the case. The expression "effective exposure," in turn, to be regarded as a purely relative one, always equivalent to the exposure that the hypothetical 100% efficiency would afford.

MODERN DIAPHRAGM SHUTTERS.

The blades of modern control-opening diaphragm shutters open to a fixed diameter, which usually corresponds with the largest stop of the lens. Apart from the cheapest models, a constant velocity is imparted to the blades up to and including the top speed, or to an intermediate high one, some mechanical device operating to hold the blades fully open for varying periods governed by the setting of the speed dial. At the highest, or some intermediate high speed, this device is thrown out of action, and the blades on attaining full opening instantly reverse. Consequently, the lens is then only working at its full aperture for the briefest fraction of a second, and relatively low efficiency results. At slow, and medium speeds the efficiency obviously rises, for the full aperture of the lens remains completely uncovered for a period which is the more prolonged as the durations of exposures are lengthened. Stopping down the lens also improves efficiency, for even at the highest speeds the full area of the reduced diaphragm remains open for some appreciable period, varying as just mentioned.

It will thus be seen that with central-opening diaphragm shutters the efficiencies are continually varying, and it follows that the ratios of the standard diaphragms are not preserved, with slow speeds to a negligible extent, but with high ones more markedly. For instance, if 1/50 second is the correct exposure at f/11.3, then 1/200 second at f/5.6 will result in some measure of under-exposure owing to the drop in efficiency, though the stop ratio in rapidity is 1 to 4. Only by fitting a lens to a shutter designed to take a larger objective can better efficiency be secured. The cheaper alternative, often listed, of an f/6.3 lens in a shutter capable of receiving an f/4.5 lens,

scores in this respect. On the other hand, for any given settings the durations of exposure, or speeds, remain constant whatever stop is employed.

THE ROLLER-BLIND SHUTTER.

Another aspect is presented by roller-blind shutters, for with them the durations of exposure vary with different stops, - shortening with small apertures and lengthening with larger. The same remark also applies to the single-blade diaphragm type with rectangular opening. Occasionally it has been found that this single point has not been readily grasped, but if two circles are inscribed on paper, a small one within a larger. and on another sheet of paper a rectangle is drawn of sufficient size to enclose the latter, and is then cut out and slid over the circles, it will at once be seen that a much longer time is occupied between the first uncovering and final covering of the larger circle, than is the case with the smaller.

It will also be apparent, without further explanation, that the smaller the stop the higher the efficiency. And here a really useful feature steps in, for the rise in efficiency with small stops just balances the shortened duration of exposure, and the effective exposure remains unaltered whatever stop is employed. Consequently, the diaphragm markings preserve their relative values -1/30 second at f/11.3, for instance, giving the same exposure to the plate as 1/60 second at f/8.

Rubber adapters are supplied in various thicknesses to fit lenses of less diameter than the shutter opening, and a separate pneumatic brief-time valve is obtainable. But by setting the lever to "T," with a fair tension applied to the spring, exposures from 1/5 second can easily be given with the ordinary bulb or wire release.

METHODS OF CONTROL.

One of the earliest methods of speed control depended upon variable spring tension applied to the moving parts, now only retained in the simpler shutters. In the better class instruments gear or pneumatic control is almost universally adopted, in combination with constant or variable spring tension.

An unavoidable limitation with the first method is that a very large increase of spring tension is necessitated to impart marked acceleration, which is inadmissible for fear of introducing vibration. The marked speeds are generally "1/25, 1/50, 1/100," Efficiencies are relatively low at all speeds.

Quite good efficiency, however, is secured with the elongatedopening shutter fitted to the original pattern of the famous box "Brownie." Whoever designed this simple to-and-fro device had a head on his shoulders, though the alternate upand-down action of the trigger is unfortunate, as the upmovement tends to shake. In the later "Six-20 Brownie," a revised version is to be found with trigger actuated in the downward direction only.

Without mentioning names it may be remarked that the projecting trigger of some box-form cameras has been known to do a little operating on its own account occasionally on the camera being inserted in, or withdrawn from its case. Surely it would be a simple matter to provide a guard, yet in only one instance has this safeguard been added so far as knowledge goes.

PNEUMATIC REGULATION.

Pneumatic regulation is due to Mr. Arthur S. Newman, a pioneer in accurate shutter construction on scientific lines, and is applied to those instruments of precision the "N. & S. Accurate," and the "N. & G. Sybil," and is retained in the "Compound," now only issued in the larger sizes.

Comparatively silent action is a strong point in its favour, and it probably remains unbeaten provided that good construction and careful adjustments are embodied. And, all important, that the size of the cylinder is commensurate with the strength of the driving spring, difficult if not impossible to achieve in small models.

If after prolonged rest the blades are found to work sluggishly, a little exercise will generally put things right.

GEAR CONTROL.

The resistance to motion afforded by a train of gear wheels has supplanted pneumatic regulation in the smaller diaphragm shutters, and advantageously so. Of all, the "Compur" stands first, and is a striking example of how human ingenuity and fine craftsmanship can overcome great mechanical difficulties, not the least being the small compass into which the complicated mechanism has to be packed.

To select one of the latest models (OS) of 22 m.m. light-aperture, as a typical example. The speeds 1 to 1/50 second are gear controlled (an escapement device being also incorporated up to 1/10) and thence to 1/100 without retardation; at the top speed 1/250, an increased tension comes into play. The makers advise that when this is used the index should always be set before winding the spring, or it may be found difficult to effect the adjustment.

The two smallest models ("Rapid Compurs"—OO, OS) can be obtained with an additional speed of 1/500 or 1/400,

according to size, automatically introduced by the setting of the index, which brings into action a strong subsidiary spring. One of them, the 22 m.m. light-aperture model, is fitted with the delayed-action shutter release, which allows the operator about 12 seconds to be included in a group. The 22 and 29 m.m. (ordinary type) are similarly provided, and it should be noted that when the "delayed action" is employed, the highest speed of the "Rapid Compurs" should never be used.

Intermediate durations of exposure between 1 and 1/50 second can be obtained by placing the index between two marked speeds, but these intermediate speeds are not vouched for by the makers, and are, perhaps, best left alone. Still, if the 1 or 1/2 second, be found to be a little on the slow side correction can be applied, or even the 1/5 second quickened up. But any attempted visual estimation of the 1/10 second is liable to lead to error, as the tendency is to over-estimate medium speeds, one which appears to the 1/10 will, on test, be usually found to be nearer 1/20.

The new Rapid Compurs assuredly bring much high-speed work within their sphere, and without the distortion which a focal-plane shutter may introduce. No tests of the latest models have been made, but even if the custom of somewhat over-stating the top speed has been followed (without suggesting this is the case) the velocity imparted to the blades would be still remarkable, and a distinct achievement having regard to the limitations imposed by construction.

At medium speeds the efficiency of the latest models is, however, not quite so high as in previous ones, in which the period of full opening was more prolonged. On the other hand, the chance of communicating vibration when fitted to cameras of light weight is proportionately reduced.

OTHER DIAPHRAGM SHUTTERS.

In abridged catalogues and advertisements of cameras the shutters are often referred to merely by their trade designation, and it may be useful if the speed range and method of control in the most familiar lower-priced instruments are summarised for reference.

The Ensign "Mulchro," which is made in the Company's works, has the usual range of speeds ($1\ to\ 1/100$) operated by gear-escapement in the lower. The Kodak "Diomatic" ($1/10,\ 1/25,\ 1/50,\ 1/100$), is also gear controlled. The same company's "Diodak" ($1/10,\ 1/25,\ 1/50,\ 1/100$), and the "O.P.S.," new ($1/25,\ 1/50,\ 1/100,\ 1/125$), combine gear-control with variable spring tension, whilst the "Kodon," the "O.P.S.," Old, and the "O.V." ($1/25,\ 1/50,\ 1/100$), and the "Kodex"

 $(1/25,\ 1/50)$ utilise the latter method of control only. In the same category are the Ensign "Trichro," $(1/25,\ 1/50,\ 1/100)$, the "Vario" and "Pronto" $(1/25,\ 1/50,\ 1/100)$ and the "Ibsor" $(1\ to\ 1/125$ in the smaller size) supplies another example of gear regulation.



Speed 55-65 miles per hour: Exposure 125 second. Camera still

WIRE RELEASES.

All have trigger and provision for wire release, and here it may be remarked in parenthesis, that useful as this accessory may be on occasion, especially when the camera is mounted on a tripod, the length of the flexible wire should always be sufficient to absorb any tremor that may be communicated by pressure on the button. This condition may not be met with short releases designed to be tucked away inside the camera. Moreover, if it is held in the hand, the fingers are virtually in the air, adding to the tendency to introduce shake at the moment of exposure.

Delayed action devices actuated by these releases are on the market, capable of being fitted to most shutters. They are of two kinds, one merely operating after the usual interval, the other giving "brief-time" automatic exposures as well.

THE FOCAL-PLANE SHUTTER.

It may fairly be assumed that the reader has a general knowledge of the way in which a focal-plane shutter works, but in case any exception exists, the writer may be forgiven for pointing out that it consists essentially of a spring-driven opaque blind with a slit across it, which is exchangeable or adjustable as regards its width. The slit passes in front of the focal-plane, and as close to it as possible, an opening in the blind, the same size as the plate, permitting focussing, and also allowing slow "instantaneous" and time exposures to be given. It differs from all other shutters, inasmuch as it may be deemed to uncover the plate or film, and not the lens, and should always be so considered.

Though simple in principle rather complex problems attach, and their solutions by the mathematically minded have been of real value to the practical worker, by drawing his attention to the strong points and inherent limitations which focal-plane

shutters present.

VARIOUS TYPES.

Any attempt to describe from a constructional aspect the many makes of focal-plane shutters on the market is out of the question, but they may be broadly divided into two classes. The first is represented by the long-blind type with slits of varying width at widely spaced intervals along its length, any one of which can be brought into use. The second consists of the double-blind, with adjustable variable separation between the two blinds. In all cases adjustments are now made outside.

The spring tension may be either constant or variable, the latter having more application to the long-blind type, as the range of speeds is then not confined to the limited number of slits provided. A drawback is that variation of spring tension may introduce rather an uncertain factor, and additional

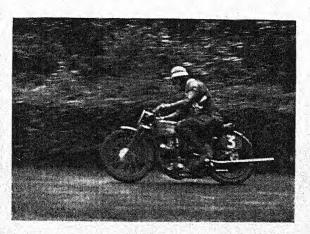
figuring is necessitated on the speed dial or tablet.

In most cases the blinds are self-capping the slit, or slits, being closed or covered whilst the shutter is being set. The addition, of course, necessitates more complex construction, with increased liability to derangement, though it is only fair to add that breakdowns appear to be rare. Nevertheless, many experienced Press photographers still prefer the simpler non-capping shutter as more resistant to rough usage, and more easily repaired should things go wrong.

TREND OF DESIGN.

Before turning to other considerations, it may be useful to indicate briefly the types of focal-plane shutters fitted to some leading reflex, press, and so-called miniature cameras on the market, as indicating the general trend of design.

In the self-capping adjustable-slit type with constant spring tension, are the shutters fitted to the "Soho Baby" reflex (the other models of the "Soho" are not self-capping), the "Ensign" reflex, the "Thornton Pickard," the "Newman & Guardia" (folding) reflex cameras, and the Adams' "Minex," though the last has a compound spring tension for high speeds. The shutter fitted to the "Graflex" is of the long-blind multiple-slit type with variable spring tension, the latter feature being incorporated in the "V.N." Press camera (a modern version of the original "Auschütz) which works on the adjustable-slit principle and is not self-capping.



Speed 65 miles per hour: Exposure 210 second. Follow through.

The focal-plane shutters built into those wonderful "Leica" and "Contax" cameras are of a different order, being no larger than many lens shutters. They are of the double-blind type with constant spring tension, and, naturally, are self-capping. Double exposures in both are automatically prevented as winding the spring causes the film to move on. With the former a vertical slit is employed, which runs in the direction of the longer side of the picture, the slit, by an ingenious device, widening towards the end of its travel to compensate for acceleration of the blind, and claimed to be highly resistant to extremes of climate. In addition to the speeds.

controlled by alteration of slit width, gear operated automatic exposures from 1 to 1/20 second are provided. The "Contax" shutter presents a distinct novelty in its all-metal blinds, and also includes gear-controlled speeds from 1/2 to 1/10 second.

DISTORTION.

As the slit in its passage exposes the plate or film section by section, one part of a moving object must always be recorded before another, resulting in distortion of its form in varying degree, usually negligible in every-day photography. But with really high-speed work, which always necessitates the use of a very narrow slit—1/8 inch or even narrower—appreciable distortion may be introduced.

To take the case of a motor car travelling across the field-ofview at right-angles to the pointing direction of the camera. With a descending horizontal slit the wheels will be exposed first in the inverted camera image, imparting a forward tilt to the car, and the familiar eliptical contours to the wheels, which, though not in accordance with fact, certainly convey an idea of rapid motion.

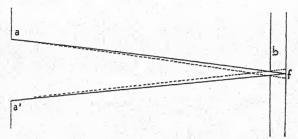
With a vertical slit travelling horizontally, the distortion introduced will be of a different kind. If the travel is in opposition to the movement of the image, it will be compressed laterally; if in the same direction, the image will be elongated, and rendered less sharply, obviously. This can be avoided by turning the camera upside down, assuming it can be worked in this position, the slit then running against the movement of the image, and consequently in the same direction as the object.

The best direction for the slit to travel is an old bone of contention, revived with energy in the booklets respectively descriptive of the Leica and Contax cameras. As a matter of fact with ninety per cent., if not more probably, of the photographs taken with these triumphs of design and construction, it does not matter a rap which way the slit moves. Though not referred to in either booklet of far greater importance is the fact that with these cameras the blind distance is reduced to about $\frac{1}{4}$ inch.

In all cases, for any given speed, the stronger the spring tension and the wider the slit, the less the distortion will be, a feature that cannot be utilised in most shutters, as will be noted.

EFFICIENCY.

The ideal 100 per cent. efficiency, often attributed to focalplane shutters in the past, can only be attained under the impossible conditions of the blind running in contact with the plate, for then every point on it would, so to speak, see the full opening of the stop of the lens employed (neglecting any marginal cut-off by the mount) during the transit of the blind. In actual practice, the less the distance between blind and plate, the wider the slit, and the smaller the lens aperture, the higher the efficiency.



The diagram, though not the best to illustrate the varied points relating to focal-plane shutters, is the simplest that can be inflcted on the reader, and, without the introduction of any appreciable error, it is hoped will convey a general idea of them. It represents, one reduced scale, an f/4.5 aperture (a a^1) of an undepicted lens, bringing two of many rays from a distant illuminated point to a focus at f, with the blind (b) and a $\frac{1}{8}$ inch horizontal slit in it, half-an-inch away from the plate or film. The efficiency is 50 per cent.

It will be seen that the coned-down rays just pass through the edges of the slit without obstruction, a partial eclipse of the upper and lower surfaces of the lens occurring in the regions between f and the dotted line on each side. A narrow line of maximum illumination, vignetting away to darkness, will

accordingly travel down in front of the focal-plane.

Now we shall not have to jam a thinking cap too tightly on the head to realize that if the slit is widened efficiency will rise, for the line of maximum illumination will broaden into a band, and at the same time the regions of partial eclipse will be reduced, though they cannot be eliminated. The same course of reasoning also applies when the lens is stopped down, owing to the lessened cross-section of the coned-down rays.

On the debit side, and often heavily so, approximating the conditions considered, is the fact that if the aperture of the lens is increased, rays proceeding from the top and bottom surfaces will not reach the plate at all (in degree dependent upon the increased diameter) being obstructed by the blind. The nominal rapidity of an ultra-fast anastigmat may therefore be seriously reduced, and unfortunately just when the extra speed is most wanted. In the same way will the rapidity of the f/4.5 lens, already converted to an effective aperture of f/6.3, be still further cut down if the blind is nearer the lens than shown in the diagram. In one or two cases met with the blinds were no less than $\frac{3}{4}$ inch away from the focal-plane.

The following tables, which appeared in the "B.J." many years ago, are self-explanatory and will save a wealth of words, for they give an excellent idea how efficiency can vary.

I.—Efficiencies (in Percentages). F/4.5 Lens.

| | Width of Slit. | | | | | | | |
|-----------------|----------------|-----------|--|-----------|--|-----------|--|--|
| Blind Distance. | • | 1 inch | | 3 inch | | 1½ inch | | |
| from Plate. | | per cent. | | per cent. | | per cent. | | |
| 1 inch | | 82 | | 86 | | 98 | | |
| å inch | | 60 | | 82 | | 95 | | |
| inch | | 51 | | 77 | | 93 | | |
| | | | | | | | | |

II.—Efficiencies (in Percentages). F/8 Lens.

| Blind Distance from Plate. | Width of slit | | | | | | | |
|----------------------------|---------------|---------------------|----|-----------------------------|----|----------------------|----|--|
| | | ½ inch per cent. | | <pre>3 inch per cent.</pre> | | 1½ inch per cent. | | |
| l i | nch | | 90 | | 96 | | 99 | |
| 3 i | nch | | 73 | | 88 | | 97 | |
| $\frac{1}{2}$ i | nch | | 67 | | 86 | | 96 | |

THE EFFECTIVE EXPOSURE.

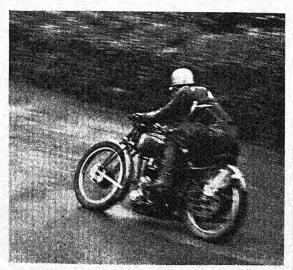
Once more we meet our rather elusive friend, again to be regarded as purely relative to the imaginary 100 per cent. ideal, in the present case represented by the slit in contact with the plate. As the tables indicate, the ideal can be very closely

approached but never reached.

Now no matter how distant the blind is from the focalplane, the effective exposure for any given slit width will remain unaltered, or in other words, the same *exposure* will be given regardless of its position, though the closer it is to the plate the shorter the durations of exposure, and the further away the more prolonged they will be, as explained under the next heading. Effective exposures, also, are inversely proportioned to the width of the slit, one twice the width of another halving the exposure, whatever the position of the blind.

DURATIONS OF EXPOSURE.

The durations of exposure with focal-plane shutters hinge on several things, the most important being the width of the slit. Assuming it to be very close to the plate, then, practically speaking, if its width is doubled every point on the plate will see the lens for twice as long (given constant rate of travel) and the duration of exposure will be halved. This is not strictly true if the blind is some distance away, but as it would require another diagram to illustrate this rather academic point, it can be disregarded. Another, by no means obvious one, is that durations are lengthened with every increased diameter of the lens opening, for the greater angling of marginal rays broaden the regions of partial eclipse.



Speed 75-80 miles per hour: Exposure 210 second. Follow through.

Apart from variations of spring tension, durations of exposure may therefore be considered as dependent upon the width of the image-forming band of light as it travels down, or across the plate or film, and an inspection of the diagram will immediately indicate that the nearer the blind is to the lens the broader the illuminated band will be, and the more prolonged the durations of exposure. Once more is seen the importance of blind distance, but this time in connection with the "arrest of motion."

SPEED TESTS.

With the system of speed testing devised by the writer, behind and close to the blind a "point source" of light is

placed, which consists of a short isolated length of a flashlightbulb filament placed vertically, error due to its length being eliminated in the readings. It is focussed on a dry-plate rotating at known speed, and the number of degrees covered by the developed trails indicate the durations of exposure. Though not scientifically correct, with the more generally useful range of speeds, but slight error is introduced, and close approximations are obtained with the fastest.

Tests of focal-plane shutters, of varying age and condition, demonstrated that in many cases the durations of exposure bore little relationship to the dial markings, and sometimes differed to a grotesque extent. On the other hand, some shutters showed up well, always excepting the top speeds, for which a good reason existed as will now be seen. average top-speed with reflex cameras was under 1/500 second.

The system of testing shutters evolved by the National Physical Laboratory at Teddington, and, the writer is informed, generally adopted in this country, works in another way. Its essential feature consists of a very narrow beam of light which oscillates in a horizontal plane at known periodicity. The beam traverses the opening in the shutter under test, and is focussed on a falling dry-plate, the number of oscillations recorded indicating the speed, which in the case of a focal-plane shutter, is defined as the interval of time taken by the opening in the blind to cross the axis of the lens.

This method, being independent of all variables, is scientifically correct, but it records effective exposures and not their durations.* At moderate speeds the two may be deemed to coincide for all practical purposes, but with narrow slits and appreciable blind distance, a marked divergence will occur. For instance, with a reflex camera of average construction and lens working at f/3.5, if a reading gave, say, 1/800 second, then the actual duration of exposure might well have been shorter than 1/400 second, owing to the drop in efficiency, a by no means imaginary case.

With central-opening diaphragm shutters, durations of exposure are, however, recorded, but with lens roller-blind shutters the readings will indicate effective exposures approximately, as here the test conditions are roughly equivalent to an exposure made with a minute lens stop, when the efficiency

closly approaches 100 per cent.

All things considered the recording of effective exposures with focal-plane shutters appears to be the better for the general

^{*} With some foreign cameras the dial markings apparently indicate "durations." The N.P.L.'s system, for instance, gives higher readings than the marked speeds on the Contra phystem. the Contax shutter.

an interval of time only.

Relative to this point, the accompanying illustrations of motor-cyclists racing, for which the writer is indebted to a young amateur photographer, Mr. K. N. Y. Yeldham, are particularly instructive, for he was working with a focal-plane shutter the speeds of which had been tested, and represent actual durations of exposure (not effective exposures) within a small margin of error. He is also an experienced motor-cyclist, and therefore able to estimate the speeds of the machines with fair accuracy. The two "follow-throughs" were secured by swivelling the camera bodily in the direction of travel at the moment of exposure. Had he been able to keep all image points absolutely stationary on the plate (obviously not possible with the wheel spokes) the riders and machines would have been rendered dead sharp, and all blurring transferred to the surroundings.

Before leaving "speeds" it may be remarked that not unfrequently it pays to have the speeds of shutters tested, which tests can be confined to a limited range applicable to the class of work undertaken. With really high-class instruments, the speeds (effective exposures) doubtless can be relied upon when they are new, but with second-hand apparatus one is indeed." buying a pig in a poke." The National Physical Laboratory undertakes testing all types of shutters at 1s. 6d. per speed. The minimum prepaid fee is 5s., to which must

be added cost of carriage.

CONCLUDING NOTES.

Mechanically a focal-plane shutter of ordinary construction is by no means a perfect instrument, yet in practice it works quite well as a rule. Acceleration of the blind undoubtedly occurs to some extent where a fair spring tension is applied, which with a descending horizontal slit will mean less exposure to the sky portion, often an advantage. On the other hand, with the slowest speeds retardation towards the end of the travel may be met with; in one or two cases it was found that the blind momentarily hung up before closing, resulting in an added band of density in the negative. All workers, too, seem to agree that in cold weather the blind slows down to an appreciable extent, and is inclined to stiffen with age. With narrow slits in use, a pinhole in the blind, or a nick in a cloth-bound slit, may cause white lines in the print, or a protruding fibre, dark ones.

COLOUR PHOTOGRAPHY OF TO-DAY

By H. O. KLEIN, F.R.P.S.

The popularisation of colour photography within recent years is in no small measure due to the activities of the colour sections of photographic societies, research work of lens and plate manufacturers, the progress made in colour cinematography and last, but certainly not least, to the pioneer work of model service stations of which the research laboratories of Messrs. "Colour Photographs" must be mentioned as standing in the front rank.

Articles in the technical press and popular lectures have done much to make the layman realise that even difficult theories of light and colour—if explained in popular language—can be understood by all, and that colour photography is

not beyond his dreams, not beyond his means.

The amateur has shown greater interest in this fascinating branch of photography, and the professional has begun to see the dawn of a day when colour photographs will be expected from him in the ordinary routine of his business.

Had it not been for the disturbing post-war conditions colour portrait photography would be well established in most

studios to-day.

LOOKING BACKWARD.

It was in 1906 that the British Journal of Photography organised the first exhibition of colour photographs, showing colour portraits made with Rotary Stripping Films, the fore-runners of one of our most recent printing processes—the Duxochrom.

At the suggestion of Mr. Howard Farmer, the British Journal of Photography approached the Royal Photographic Society suggesting a permanent collection of some of those early works. The Council, accepting the proposal, agreed to find proper accommodation.

The best work in this Exhibition was done by means of

repeating backs and stripping films.

I described the process in the British Journal of Photography of September 29th, 1905, under the heading "Colour Photography with Pigment Films." The following quotation may be of interest to-day: "My description of the process may, perhaps, indicate a complicated and expensive procedure, but this is certainly not what I wish to convey, for it is perfectly simple provided the negatives are correct. If worked systematically I see no reason why portraits in colour should not form a lucrative branch of professional photography. It may mean a general revival of portrait photography and perhaps better times, until competition will cut the high prices which would have to be demanded for this kind of work."

And to-day, I cannot do better than underline words

written more than a quarter of a century ago.

If you ask me whether the early specimens compare favour-

ably with work of to-day, I must certainly say "Yes."

The colour stereogramms of Ives, the colour transparencies of Miss Acland, done with the Sanger Shepherd process, have never been surpassed in brilliancy and truthfulness of colour, and only Technicolor of to-day can approach them.

Yes, even the earliest colour collotypes of the Photochromatic Printing Company of Belfast may well pass as

excellent present-day work.

WHAT PROGRESS HAS BEEN MADE?

Of course, I do not mean that the progress made has been negligible, but far reaching as it has proved to be, it has only

revolutionised working methods.

Is this advance to be underestimated? Do I not remember the days when I had to make my own colour filters, colour sensitise my plates and give an exposure of one hour to get a blue printer because single exposure cameras securing the 3 negatives in the fraction of a second and panchromatic plates were not known in those days?

Ducos du Hauron and the great Clerk Maxwell in all their prophetic dreams could not have visualised modern illustration of topical events in colour or anticipated the glories of colour cinematography—which is only in its infancy to-day!

But they have laid the foundations of present day work and

to them all honour.

On this fruitful ground, yet always based upon principles laid down by the early pioneers, new colour processes have sprouted like mushrooms. Some to scintillate upon the financial horizon just long enough to lure the pious believer in patent specifications into bad investments of his money, others to interest from a purely academic point of view, yet others to expire in the laboratory stage for want of sufficient stamina to wait for public recognition.

And surrounded by this bewildering array of the old and the new, the genuine and the doubtful, stands the potential colour worker, his vision circumscribed by his meagre knowledge of the intricacies of colour photography, in search of a process which will not let him down.

THE SELECTION OF A COLOUR PROCESS.

I shall endeavour in the following to select, classify and suggest. I shall deal more fully with processes I have worked myself and have found to be free from vexatious uncertainties.

I shall catalogue all known up to date, and available to the

experimenter or likely to be available.

The beginner will have to make the final selection after having answered the question whether he wants colour photographs on paper or is satisfied with the much easier methods of the colour transparency or lantern slide.

Permitted to offer advice here, I strongly suggest to the newcomer in colour photography that he should confine himself to transparency work until he has sufficient enthusiasm to lift him over the obstacles which colour photography on

paper most certainly has in store for him.

After having obtained with comparative ease a set of gorgeous colour slides or transparencies, he will feel "mightily pleased" and in this frame of mind refuse to be discouraged by all sorts of troubles he never dreamt of, but which he will eventually find to be extremely fascinating, ever inviting him to further advance in colour photography.

COLOUR SCREEN PROCESSES.

All screen plate processes "Lumichrome," "Filmcolor," "Agfacolor," "Dufaycolor," "Finlay," etc., are intended for the production of colour transparencies and are based upon suggestions made by Louis Ducos du Hauron in 1876.

Glass plates or films are surfaced with an enormous number of tiny filters, either in mosaic or in geometrical patterns in the colours of red, green and violet. Upon this surface, a panchromatic emulsion is coated and the exposure is made through the glass or celluloid.

The light coming from the lens has therefore to pass through the microscopic colour filters before reaching the emulsion film. These processes do not require special apparatus. Some

are film, others plate processes.

They are extremely simple to work, and provided the instructions of the makers are carefully followed, enable any capable amateur photographer to produce within a very short time excellent colour photographs.

Moreover, some of the makers undertake to develop and finish the exposures at a reasonable cost, in some cases included in the price of the film.

The selection of suitable subjects, and in particular of suit-

able lighting conditions, is important.

The last, however, is applicable to all processes of colour photography.

Lumière Autochrome Flat Films-" Filmcolor."

Filmcolor is sensitive to all colours and must be handled in a special green light. The films are not suitable for placing into a darkslide without some rigid support, which is provided by a film carrier supplied by the makers.

If immediate development cannot be carried out, the protecting paper supplied with the films may be folded back again and the film returned to the original packing.

Filmcolor requires a yellow correction filter, obtainable

from the makers at a trifling cost.

The instructions sent out are very explicit and easily understood.

Messrs. Th. Grant Ltd., Polebrook House, Golden Square, London, W. 1, or La Société Lumière, 82, Rue de Rivoli, Paris, are at all times willing to offer technical help and if required to develop and finish amateur exposures.

Lumière "Lumicolor."

Whereas Filmcolor requires a plate camera and special compensating filter, Lumicolor may be exposed in rollfilm cameras, requires no filter and due to its high speed enables the photographer to take snapshots in colour, provided he works with a large aperture lens in relatively good light. The speed of Lumicolor is 10 times that of Filmcolor and in good summer light with a lens working at f/4.5 exposures of 1/10 to 1/20 second are possible.

The price of a Lumicolor spool (4 exposures) includes developing and finishing done by the Lumière organisation to whom the exposed films may be posted.

Lumicolor films are made in sizes $3\frac{1}{4} \times 2\frac{1}{4}$ ins. and $2\frac{1}{4} \times 4\frac{1}{4}$ ins. to fit all standard cameras.

The mosaic coating of coloured particles of starch grains which forms the base upon which the emulsion is coated must be examined under a microscope to be fully appreciated, for each particle is about 1/15,000 inch in diameter and a plate measuring $6\frac{1}{2} \times 4\frac{3}{4}$ ins, is covered with some 120 millions of these starch grains.

Agfacolor Plates.

Colour mosaic on glass plates. No carrier required. Inserted into darkslide so that glass faces the lens. Focussing screen must therefore be reversed. The plates are supplied with special black cardboard so as to protect the film from being damaged by the springs of the darkslide. Special light filters are to be used and are supplied at a very reasonable price by "Agfa Photo" Ltd., 4, Lawrence Street, High Street, London, W.C. 2, who are the distributors of the "Agfa" products.

The plates are easy to work and give very beautiful colour transparencies.

Agfa Flat Films and Agfa Color Ultra Roll Films.

Agfa Flat Films require a filmholder similar to Filmcolors of the Lumière Co. They also require a compensating filter on the lens. Treatment during development etc. is similar to the Lumière. Special darkroom light is requisite. There is great similarity between the two processes of which Lumière may claim to have done the pioneer work. The mosaic of the Agfa Films is not based upon starch but resin particles.

Lumière colour transparencies appear to be warmer in colour, but slightly less transparent than Agfa.

Both methods are extensively used in scientific photography, e.g., bacteriology, botany, zoology, mineralogy and microscopical records.

For a quick production of lecture slides these processes are unrivalled, as developing, reversing and finishing of a slide can be done within a quarter of an hour!

The Agfacolor Ultra Roll Film.

No filter is required with these films which are worked like Lumicolor. They are much faster than the flat films or the colour plates.

In other respects they are treated like all colour mosaic plates. They may only be handled in special green light or complete darkness, can be desensitised, are not fixed but reversed and redeveloped.

According to a table of exposures published by the makers fractional second exposures are possible at almost any time of the year within the hours of 9 a.m. and 3 p.m. if a large aperture lens is used.

The Agfa Company also undertake to develop and finish their films at reasonable charges.

Dufaycolor.

Dufaycolor is the last addition to screen colour photography. The films are supplied by Ilford Limited, of Ilford, England, as roll films, film packs and in 16 mm. and 9.5 mm. substandard ciné films. Rollfilms, filmpacks and miniature camera films require no compensating filter if exposed in daylight. Very explicit instructions are contained in a pamphlet issued by the makers, who have also established a service station for processing exposed films.

Snapshot exposures in rollfilm cameras are possible if conditions applicable to all colour photography are available.

The process is of great value for the production of trichromatic separation negatives in process work, and in many branches of scientific research, for clinical records of skin diseases, mineralogy and for lecture purposes.

Care must be taken not to overheat the films in the lantern.

The projected Dufaycolor slides are of delicate colour and very true in colour rendering.

The films are extremely simple to work and should in the hands of a careful worker give every satisfaction.

Concluding the section dealing with screen mosaic processes, I should like to assure the beginner, that they are in every respect reliable, and if treated with proper care and in accordance with the instructions, will give the utmost satisfaction.

I was privileged to work with the first Lumière Autochrome plates in 1905 and found them at that time as I find them to-day, so fascinating and so inviting to invest one's pocket money, that I had to use stern measures of self-repression to avoid sinful extravagance. I feel like that to this very day.

Now, having sung the praises of the combined colour screen processes, I must also state their limitations.

Their beautiful offspring can not be successfully duplicated, they remain individuals. What a relief in this age of mass production.

But there is something else. For although screen colour processes are capable of reproducing with the utmost fidelity the glow of fluorescent solutions, the mysterious fire of the opal, the lustre of gold and silver, the sheen of silk and satin, the deep colour of amethyst and ruby, the superb green of the emerald and all the subtle tints of flesh and mother-of-pearl, they fail to reproduce the tender primrose or the full colour of the daffodil, they hardly indicate the bluish red of a rose.

Avoid these colours when using screen colour processes.

DUPLICATING SCREEN COLOUR PROCESSES.

In these processes, of which "Finlay" is the present-day representative, the mosaic or pattern of colour filters is printed on a separate glass plate, called the "taking screen" which is placed into close contact with the film surface of a panchromatic plate during exposure.

A separate viewing screen is used, which must be placed in contact and in perfect register with the glass positive taken from the original screen negative.

This master negative will of course yield any number of copies which only require registering with viewing screens.

The Finlay Colour Process.

The materials required to work the Finlay process are: compensating filters, suitable for varying types of light, supplied in film form or sealed between carefully selected glass plates.

Taking and viewing screens, panchromatic plates, positive plates, bulldog clips and binding strips. The Finlay organisation "Finlay Colour Ltd." of Brettenham House, Lancaster Place, London, W.C. 2, supply special trial outfits and undertake the finishing of their customers' exposures.

The ruling of the taking screens varies from 175 to 400 lines per inch.

This process is not difficult to work, but care must be taken to develop the negatives as delicately as possible so as to avoid colourless highlights in the diapositive.

The process requires more skill and is more expensive than the combined colour screen processes, because careful registration of the positive and the viewing screen are requisite, and every transparency requires a special viewing screen.

Parallax, displacement of positive image to viewing screen, is claimed to have been overcome by the introduction of a special Non-Parallax Colour Screen.

TRICHROMATIC PRINTING PROCESSES OF COLOUR PHOTOGRAPHY.

The only processes of interest to the practical colour worker are those which require three colour-separation negatives. These negatives, from which impressions are to be made in the colours red, blue and yellow are not difficult to produce.

The cheapest way of making the negatives is to have a sliding carrier immediately behind the lens. The lens will have its flange on the carrier into which slide the colour filters in a separate frame. The carrier can be very lightly

constructed but care must be taken to prevent stray light from getting between lens and filter by using strips of velvet.

The colour filters should be large enough to cover the full aperture of the lens. For experimental purposes, it may serve to put the gelatine film filters as supplied by the Ilford and Kodak Companies, between well selected plate glass, but for more exacting work it will be necessary to purchase cemented filters, or to cement the films between well selected plate glass. Without experience, I should not recommend colour workers to cement the filters themselves.

By using three darkslides filled with panchromatic plates and shifting the colour filters between each exposure, obtaining the three separation negatives is not a difficult problem.

It is obvious that any shifting of the camera or movement of the object during exposure will spoil the set, but with care perfect colour separation negatives can be made from still objects. Flowers do not always fit in to this category, and sitters who can endure exposures of several seconds without movement are not easily found.

As the changing of the slides wastes a good deal of time it was found preferable to combine carrier and dark-slide, which led to the construction of Repeating Backs.

REPEATING BACKS.

Repeating backs fit on to the back of the camera. They carry the filters and the plates and the 3 exposures can be made within 10 to 20 seconds including the capping of the lens between each shift. The Autotype Co., Ltd., of 59, New Oxford Street, London, W.C.1, and the E.S.S. Colour Filter Co., 22, Bloomsbury Street, London, W.C.1, supply these repeating backs in very reliable construction and at a reasonable price.

In the latest pattern of the E.S.S. Colour Co., a screw movement has been introduced which not only shortens the time of the change-over, but lessens the risk of moving the camera.

As it is advisable to use the same type of plate for all three exposures, development should be done simultaneously.

The Automatic Repeating Back of Messrs. Colour Photographs, Victoria Road, London, N.W. 10, may be attached to any strongly built field or studio camera, and has proved to be thoroughly reliable for very varied professional work:

It is eminently suited for studio portraiture, and a wide range of outdoor subjects, but does not permit photography of moving objects. It is a high precision instrument and therefore somewhat costly. The slide contains the three filters close to the panchromatic plates and is moved by a clockwork device and liquid dashpot, which ensures exact and controllable exposures.

So quickly and smoothly does this device work that the

three exposures can be completed in two seconds.

The whole of the timing and moving mechanism is entirely automatic and is set in motion by pressing a cable release.

The three dials can be set independently, and give shutter

exposures from 1/8 of a second to six seconds.

For half-watt light in the studio, a special set of Vivex filters is supplied.

ONE EXPOSURE THREE-COLOUR CAMERAS.

An infinite variety of suggestions have been made in endeavours to split up the light between the three plates of a simple exposure camera and patents claiming to have solved the problem would fill a fair sized book.

The most serious difficulty to overcome was stereo parallax, and double image reflection. The first was due to the splitting up of the light by using three different portions of the lens, the other to the two surfaces of the glass reflectors not being close enough to each other to prevent double image reflection.

Although stereo parallax may to a great extent be diminished by complicated devices, it would serve no purpose to describe cameras employing them, they are only of interest to the

cinematographer.

I shall therefore confine myself to a description of two cameras which are actually on the market and have been sufficiently used by professional workers to stamp them as being reliable and simple to work.

Major Adrian Klein's Tri-Colour Camera.

The difficulty of double image reflection has been completely overcome in this camera by the introduction of film reflectors which, stretched upon optically planed metal frames, present optical flat surfaces of good reflecting power.

There is no refraction or aberration whatever. These mirrors although extremely thin (0.0001-0.001) in are strong enough to stand cleaning with chamois leather.

Placed in an humidifying tunnel for three months, they showed no appreciable distortion.

Deposition of metals has been found possible and the introduction of half platinized film reflectors will make the construction of fast working single exposure cameras possible.

Major Klein's camera is fitted with a 4.5 aperture Dallmeyer lens of 7 ins. focus and a Compur shutter. Being in box form and constructed of aluminium alloy it is a handy instrument, but sufficiently rigid to ensure negatives of perfect register.

The camera is constructed by Messrs. Bellingham & Stanley Ltd., of 71, Hornsey Rise, London, N. 19, and can be obtained from Messrs. Farquhar & Moloney, 6, Denman Street, London.

Snapshot exposures are possible in good light throughout the year at hours suitable for work of this character.

A readjustment of the filters to suit half-watt conditions has made this camera excellently fitted for studio work in artificial light.

THE TAYLOR HOBSON (VIVEX SYSTEM) ONE EXPOSURE TRI-COLOUR CAMERA.

This camera represents the combined outcome of the investigations of Messrs. Taylor, Taylor & Hobson, the well-known optical instrument manufacturers of Leicester, and of the research laboratories of Messrs. Colour Photographs, Ltd., of Willesden, London, N.W. 10. The pioneer work of both firms is too well-known to call for special mention.

The camera is so constructed that at full aperture the plates are uniformly exposed without vignetting and ghost reflections, while the viewfinder (rangefinder) operating over the whole field and interlocked with the lens, permits focussing

right up to the moment of exposure.

Light, on entering the camera, is divided by semi-transparent mirrors set at 45° to the lens axis to form two images, and is partly transmitted by both reflectors to form the direct image. The lens is a 81'' Aviar anastigmat working at $f/4 \cdot 5$.

Focussing can also be done by ground glass.

The camera is cast in light alloy and the optical parts are rigidly located. The plate size is 9×12 cm., the weight of the camera 12 lbs. Successful colour photographs at 1/50 second have been taken in England during the summer months.

In concluding this chapter which dealt with the appliances available for making the separation negatives for colour

photography, I summarise as follows:-

Colour separation sets of negatives can be made by:—

(1) Three colour filter attachment as sold by the Autotype Co., of New Oxford Street, London. This attachment affords a rapid and easy change of filter but not of plate. It is obvious that it is a very slow mode of working, but in the hands of a very careful worker will give results good enough for experimental work.

(2) By means of simple repeating backs where filter and plate are moved in a slide. This will be found to be a more rapid form of change-over. Portraiture of steady sitters will be possible, and landscape work without moving foliage in the near foreground. Photography of animals or children or snapshots of any kind cannot be done.

(3) Repeating backs with screw movement, E.S.S. Filter, Co., London. Quicker change over than No. 2. Including capping of lens exposures can be made within 10 seconds.

These repeating backs are widely used in the U.S.A.

(4) Automatic repeating backs, Colour Photographs, Ltd., London. Precision instrument. Timing and moving mechanism automatic. Exposures completed within 2 seconds. Recommended for serious professional work. Fine piece of apparatus, but more costly than ordinary repeating backs.

(5) One exposure three colour cameras, Klein tri-colour camera, Taylor Hodson—Colour Photographs, tri-colour camera. Both excellent instruments for snapshot colour work. Taylor Hobson camera is more elaborate in construction than Major Klein's camera, by virtue of semi-metallised reflectors permitting shorter exposures than the Klein camera.

It seems to me that at last we have reached the advent of satisfactory tri-colour one-exposure cameras. Further improvements are sure to be made, but in principle they will remain the same. If I am permitted to prophesy, and this is safe in view of the activities in the U.S.A., I would predict that the future of professional portrait photography in colour will be found in metallised single semi-reflector cameras and bi-packs in size not less than 5×7 ins.

The definition of a bi-pack in such size is quite good enough for portrait work and the speed of such a camera must obviously be greater than that of the present single-exposure threecolour type. That the cost of a camera with such a simple optical system built of wood must be considerably lower than that of metal precision cameras goes without proof.

Where perfect definition is requisite the single exposure

tri-colour camera must hold the field.

THE PRODUCTION OF THE TRICHROME PRINT.

Here again, we must differentiate between prints on transparent media and prints on paper, etc.

I shall just touch on the printing processes available for transparency printing. The beginner may well ask why one should go to all the trouble of making trichromatic separation negatives when by means of screen mosaic processes such as Lumière, Agfa and Finlay, excellent colour lantern slides can be obtained in the short time of 20-30 minutes.

I will try and answer this question.

The reader will probably have noticed by the praise I lavished upon Screen colour processes that I am very much in love with them. Well, I confess, I am.

But this love has not blinded me to their shortcomings. Have you ever had an opportunity to see a screen colour ciné film projected under the same light conditions as a colour film produced by a process such as Technicolor?

Can you imagine the difference in luminosity and purity of colour if such a picture as "Turner's Fighting Téméraire" were projected in a lantern by means of slides, one made by screen-colour processes and the other by imbibition?

The loss of light in all screen mosaic processes is very great. Even pure white can only be reproduced at the best as a neutral grey, and the brilliant chrome yellow as a mixture of red and green. But there are processes which permit the full passage of light and project pure colour and not colour mixtures by adding the primaries red, green and blue-violet, and with such processes I propose to deal.

TRANSPARENCY PROCESSES BASED UPON IMBIBITION OF DYES.

These processes, representing the oldest methods of photographic trichrome picture production, some actually dating back to 1867, are laborious. They are not to be recommended to impatient workers in colour photography, but they are capable of furnishing slides in colour which no other modern colour process can possibly give.

The colour rendering in these slides is perfect, because theoretically correct colours are used; they are as transparent as ordinary lantern slides, which means that their projection does not require special lighting conditions, and made by substractive colour processes they project pure coloured light, not coloured light mixtures upon which even the pure white of the additive processes depend.

These processes are based upon gelatine or glue reliefs formed by the action of light upon bichromatised films, absorbing or making a loose chemical combination with very diluted aniline dyes.

The stained films are cemented together with Canada balsam—the least delectable part of the process—and are bound up with binding strips.

The late Mr. Sanger Shepherd introduced commercially a process of this type and known by his name. He used a blue

cyanotype toned lantern slide for the blue impression, which also acted as a cover glass.

Full particulars and materials to work this process are still obtainable from the E.S.S. Colour Filter Co., already mentioned in connection with repeating backs.

Descriptions of variants of this process, some using fishglue and mica plates, others three celluloid films stained with dyes and cemented between two covers, are to be found in Wall's "History of Three-Colour Photography" and Klein's translation of Hübls "Three-Colour Photography."

It will be noted that only contact prints are possible by these processes.

COLOUR PHOTOGRAPHY ON PAPER.

We have seen in the foregoing that subtractive colour processes are based upon the superposition of yellow, blue and red prints, which must be made from three colour separation negatives. These negatives are called yellow, red and blue printers respectively. The hue of the printing colours must conform with the theoretical requirements of trichromatic synthesis, but a certain latitude had to be conceded because theoretically correct printing colours are of a very fugitive nature. The colours generally used are less free from admixture with black, a defect from which the pure aniline dyes used for colour transparency work do not suffer.

PIGMENT PROCESSES.

The processes coming under this heading are "Trichrome Carbon" and "Trichrome Carbro."

Trichrome carbon can only be used in contact printing from the original separation negatives, but trichrome carbon is made from bromide prints which can be enlarged.

Both processes are extensively used in professional work. To praise their merits is superfluous because trichrome carbon or carbro are well known to visitors of exhibitions of colour work. The Autotype Co. Ltd. of 59, New Oxford Street, London, W.C. 1, will send details of these processes of which they are rightly considered pioneers.

The best recommendation of trichrome carbro is to be found in the magnificent work of Messrs. Colour Photographs whose Vivex method of printing is based upon the carbro process.

CONCLUSION.

Although the building up of a trichromatic print provides the beginner with a source of joyful anticipation, the materialisation of a really satisfactory print depends, as far as he is concerned, to a great extent upon guesswork which is for ever

foreign to the expert worker.

Let this not discourage you. If you think you have made a set of really good separation negatives, delicate in the highlights and full of shadow detail, with a grey scale in an out-of-the-way corner rendered in equal densities in all three negatives, and yet fail to get a print which pleases you, do not blame three-colour photography, but send that set to a service station and await the verdict of their expert. Do not send them an order to make a print from your set, but ask them to be good enough to do so . . . if they consider your negatives to come up to their standard.

It will save you a lot of money and temper. Once you have been told what is wanted, you will be encouraged and put up with minor disappointments during your own attempts

to copy their work.

There are several such stations on the continent, doing excellent work in relieving a busy colour photographer from the routine work of printing, but in this country there are only two up to the time of writing—Messrs. Colour Photographs Ltd. of Willesden, London, N.W. 10, and Messrs. Farquhar & Moloney of 6, Denman Street, London, W. 1.

The last named firm are supplying prints made by the Duxochrom process, which is a colour film stripping process of great promise. These service stations are conducted by experts

with great experience in trichromatic work.

There are other tri-chromatic printing processes which are based upon imbibition and of which the Irix process attracts special attention, by reason of an extraordinary quick transfer of dye from celluloid relief to paper. Up to now I have had no opportunity to verify the claims of the inventors, as materials are not available. However, the prints made by the Irix process which I have seen are of better definition than prints made by a similar process, the Jos-Pé.

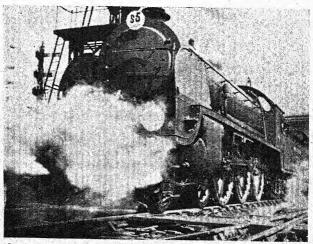
One of the claims made by Irix is complete transfer of the dye from the matrix, which should ensure greater uniformity of impressions. The process is at present under the consideration of cinema concerns, but may be exploited for tri-

chromatic paper-printing in the near future.

ENGINEERING PHOTOGRAPHY.

By BERNARD ALFIERI, Jun.

Engineering offers such a wide field of material to the amateur photographer that there is ample subject matter for all types of cameras, and the interest that prompts many of us in our youth to declare that we are going to be engine drivers when we grow up, remains dormant in spite of the force of circumstances that lead us into very different occupations. It only needs an excuse in the photographically minded adult to revive the latent spirit that prompts most of us to build or produce mechanical devices just for the sheer pleasure of seeing them work.



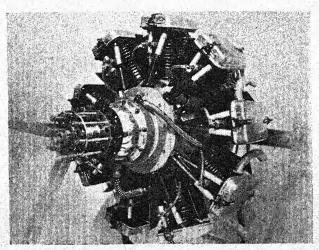
Southern Railway engine leaving Waterloo Station. Note the value of the low view point and the sense of power conveyed by the puff of steam.

Photography finds its way professionally into every branch of engineering, and such pictures may be produced to illustrate mechanical principles and constructive designing, apart from the invaluable question of accurate records, while many engineering photographs possess a degree of pictorial beauty

that is not only pleasing from the artistic point of view, but

ideal for advertising purposes.

For the amateur cinematographer there is a chance of illustrating progressive movement, or steps in any constructional device, and as one small instructive example, the picturing of mechanical laws by means of suitable models, or the recording of mechanical movement either at normal speed or slow motion, will form a perpetual excuse to air an old film for the pleasure of young and old alike.



Aero engine ready for the test bench. By courtesy of the British Salmson Aero Engines, Ltd. A photograph taken in direct sunshine.

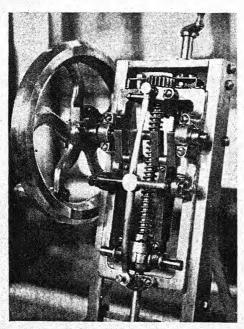
Series of pictures either still, or animated, will always have an appeal if shown in sequence, and from the familiar sewing machine to the mechanical propulsion of a big liner, there are endless opportunities for the photographer to accumulate a collection of pictures that will retain interest long after their

contemporaries have faded into forgetfulness.

Many engineering works will grant permission to any bonafide amateur photographer to obtain pictures, and some industries look upon such consent as a form of advertisement that tends to popularise their products, while the advancement of modern cameras enable such pictures to be taken without the necessity of special facilities that might delay the work or hamper those who grant the privilege. Apart from work of this nature, there is ample subject matter available at every turn, scarcely a bridge or building that has not some interesting feature, and a simple screw is a fascinating subject in itself.

TYPE OF CAMERA.

If any and every class of engineering photography is to be tackled, a very extensive photographic equipment, with a comprehensive collection of lenses and accessories will be required, but from the amateur standpoint it is only in rare cases that such a wide field must be covered, and the owner



Model of a hand rock drilling machine, photographed in daylight through a glass show-case. An example of reflex work at close range.

of a small box camera can find quite as much material as the proud possessor of a better instrument.

Cameras of the reflex type are particularly useful where small parts or objects are to be taken, not only from the ease with which the picture can be composed, but also because they will allow sufficient extension to get close to the subject, and although large negatives will always possess a degree of excellence that is difficult to obtain on a small camera, the

advantages of a short focus lens are so obvious that many professional photographers to-day are employing miniature cameras of the Leica type for this class of work. It should be realised, however, that these small negatives must be perfect.

MINIATURE CAMERAS.

The precision and excellent workmanship of modern miniature cameras widens the scope of the work and the ease with which difficult subjects can be tackled. Combined with the advancement of fine grain films and developers, it should be possible to get big enlargements from most negatives; and in my own case, I have made crisp enlargements of mechanical subjects taken with a Leica on standard ciné film, that show very little grain up to 20×16 ins. The accompanying illustration of a double reduction gear from a steam turbine, is one of such photographs, where in spite of using super panchromatic film which is acknowledged to possess the maximum grain, good clean sharp enlargements up to 20×16 ins. are possible.

In this example, the camera was held in the hand, and an exposure of $\frac{1}{20}$ -th second at f/2 gives sufficient depth of focus to cover the subject, which would have been impossible at such a large lens stop on a bigger plate. To stop down a longer focus lens in order to obtain the same depth of focus on a bigger camera would have required a much longer exposure resulting in the use of a tripod, and in some cases where

machinery is moving, this would be impossible.

PLATES OR FILMS.

Very slow contrasty plates or films may be an advantage for dull, flat subjects, particularly taken in poor light, but as a general rule, very fast preferably panchromatic material will

offer the widest scope.

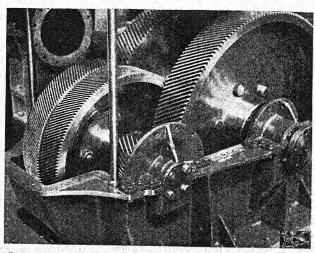
With miniature cameras, it must be remembered that the faster the film, the more grain will show, but if the exposure is reasonably correct, and the processing done with care it need not be excessive, as can be seen in the accompanying example of gearing, which was taken on a super pan film of the most rapid type. In this case the grain can be detected in enlargements over about 10×8 ins., but in appearance it looks like a fine texture that adds rather than detracts from the finished result.

LIGHTING.

When taking photographs of mechanical objects, the lighting conditions are as important as in portraiture. If you light a simple cog-wheel from behind the camera, the result will lack modelling, and it may even be difficult to detect separate teeth, whilst to light it from one side will result in deep shadows that may have conflicting detail.

As a general rule the light should be about half way between,

that is roughly an angle of 45° to the camera, and the introduction of secondary lighting from an opposed angle will tend to soften the shadows if this is required, although bold shadows if carefully placed may be turned to advantage to show up light parts of the subject, or form a pleasing composition.



Double reduction gear from Parsons turbine. Picture enlarged from ciné film, exposure 1-20th sec. f/2. Taken with Leica camera held in the hand. Lighting, subdued daylight. Contact print inset.

FLASHLIGHTS

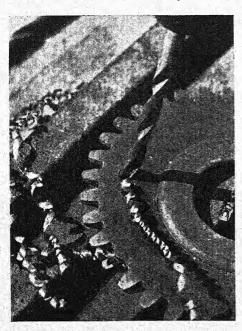
Although we may lay down laws as to where the light source should be, it is sometimes necessary to take advantage of any light that may be available, regardless of position, and quite often we may be faced with no reasonable light at all. Flashlight can often be turned to advantage as a means of supplementing or overbalancing existing lighting conditions, and a very small flash (or flash bulb) will be of great service, particularly in conjunction with a miniature camera employing a large lens aperture, as this will enable a comparatively small flash to fully illuminate a considerable area.

In some cases where the light is by necessity in a bad position, or even directly in the lens of the camera, this can be overcome by well stopping down the lens to kill the daylight and using a big flash, but it should be remembered that

flashlight is at best a way out of a difficulty, and preference should be given to daylight wherever it is possible, as it offers the softest result with the maximum amount of detail, both in the shadows and highlights, and there will be no fear of obtaining bad reflections from polished surfaces that cannot be detected before making the exposure.

HIGHLY POLISHED MACHINERY.

Many machines, particularly those offered for exhibition



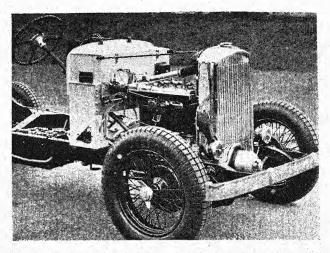
Close up study of a drill. Taken with the aid of a single lamp. Note how the bold heavy shadows give a dramatic effect to the subject

or demonstrating purposes are polished in a way that is a delight to behold and a nightmare to the photographer. Care should be taken to watch for stray reflecting surfaces, and there will often be a chance to eliminate troubles of this nature by moving the view point slightly. If this cannot be overcome, a little piece of dry soap rubbed on the offending parts will remove excessive shine without fear of scratching the surface. In many suba wideiects angle lens is necessary.

PICTORIAL EFFECTS.

Perhaps one of the greatest factors that go to make the unknown quantity referred to as pictorial work is the composition not only of subject matter itself, but the careful planning of big spaces of light and shade.

The same object taken at different times of the day, or by changing the lighting conditions will produce an entirely different result; one may be of pictorial value, and the other worthless.



Car chassis. By courtesy of the British Salmson Aero Engines, Ltd.

Bold dark masses can be utilised to throw intricate detail into simple relief, and the gift to take advantage of any local atmosphere is the final test. A puff of steam as a locomotive starts may produce a state of exasperation in an engineer who wants to record the position of each nut and bolt, but may be the making of the picture from the artistic point of view, and although it may cover a certain portion of the subject the fact is often more than balanced by the life and vitality that an action photograph will always hold over one taken purely from the scientific angle. For the same reasons, interiors photographed during working hours, with the steam and general atmosphere of human endeavour will always have an appeal that a carefully planned picture may lack, however perfectly it may be taken, and the introduction of the human element is an invaluable help as a contrast to the precision of the mechanical world.

PICTORIAL SUPPLEMENT.

A List of Photogravure Reproductions of works, by well-known Photographers, arranged in the order in which they appear.

R. N. Speaight (London).— Pearl Hay.

Yvonne Gregory (London).
—Figurehead.

Thos. Fall (London).— Broken Slumbers.

GLADSTONE ADAMS (Whitley Bay).—Mauretania leaving Tyne on Her Maiden Voyage, 1907.

I. Bertoglio (Turin).—The Experts.

ARCHIE HANDFORD (Croydon).—Portrait of R. N. Haile. Esg.

DOROTHY WILDING (London).
—Stockings.

F. SIMPSON (Los Angeles).—
The Idol.

HAY WRIGHTSON (London).
—Saporta.

E. R. YERBURY (Edinburgh).
—Adoration.

George Fayer (London).— Sir Austen Chamberlain.

McLagan & Cumming (Edinburgh).—The Captain's Son.

YEVONDE, LTD. (Manchester).
—In Quest of Beauty.

A. Hudson (Bridlington).— Tin Ghaut, Whitby.

Basil Shackleton (London).
—Catherine of Aragon.

MARGARET EDGAR (Minehead).—Decorative Panel.

W. R. KAY (Southampton). —Memorial Gateway, Winchester College. Vandyk (London).—Rt. Hon. Earl Balfour.

J. Pecsi (Budapest).—Study. G. L. Hawkins (Oxford).—

Breaking Wave.

C. E. SWEETLAND (High Wycombe).—Mary.

NORMAN A. SQUIRE (Kingsbury). — The Morning Toilet.

P. SWEATMAN HEDGELAND (Maidstone).—Pan.

Daisy E. Edis (Durham).— Mute Adoration.

Walden Hammond (Leamington Spa).—Finale.

DORA HEAD (London).— Smiling Child.

Julian Smith (Melbourne).
—Tares.

W. H. Cox (Luton).—Industry.

P. PELHAM CROWE (Romford).—The Longshoreman.
BERTRAM PARK (London).—

Youthful Charm.

DOROTHY WILDING (London).
—Hauteur.

C. J. SYMES (Birkenhead).— Glancing Shadows.

R. N. Speaight (London).— Sheilah, Daughter of Mrs. H. E. Tilbrooke.

A. ANGYALFI (Hungary).— Kirchgang.

HAROLD BURDEKIN (Reigate).
—Content.

MARCUS ADAMS (London).—
The Lassie.

JOHN ERITH (Croydon).—In The Wings.

A. J. Bowland (Durban).—
The Joy of Living.

BERTRAM SINKINSON (Staffford).—The Creative Impulse.

BERNARD ALFIERI, Jun. (Surbiton).—A Flying Feat. Yvonne (London).—Poise.

J. ORTIZ ECHAGUE (Madrid).
—Bebedor Vasco.

RICHARD N. HAILE (Bognor Regis).—The Matchseller.

K. REITZ (Wembley).— Enjoyment.

DOROTHY SHERWOOD (Dover).
—The Alsatian.

PETER PITT (London).—Coal.
W. H. CUMMING (Weymouth).
—A Dennis, Esq., J.P.
(Age 96).

H. W. LAMBERT (Canterbury).

—Happy Days.

M. Butler (London).—Head of an Old Man.

F. J. MORTIMER (London).—Battle.

GILBERT ADAMS (Reading).
—Dolores.

HOWARD COSTER (London).
—Col. Lawrence of Arabia.
HERBERT LAMBERT (Roth)

HERBERT LAMBERT (Bath).
—Cortot.

URSULA HARTLEBEN (London).—Sidonie Goossens.
RICHARD N. HAILE (Bognor

Regis).—Nude Study. T. F. Brogden (Scarborough). —An Old Monastery

Kitchen.
O. C. WILMOT (Carlisle).—

Sunny Memories.

Nancy Higgs (Orpington).
—Die Walküre.

D. S. HERBERT (Weymouth).

—Mute Appeal.

Edwin Broomer (Torquay).

—Poise.

W. FOSTER BRIGHAM (Bridlington).—The Accordionist.

F. BOWEN WILLIAMS (London).—Quay Street, Scarborough.

Jan Lauschmann (Czechoslovakia). — Drinking Children.



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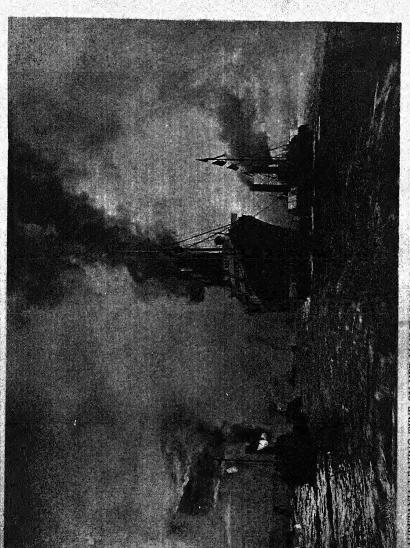
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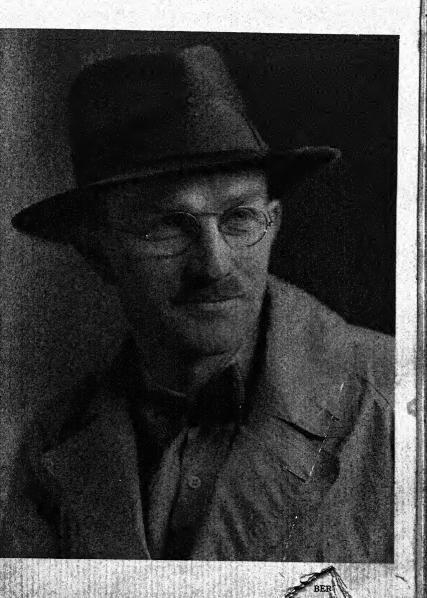
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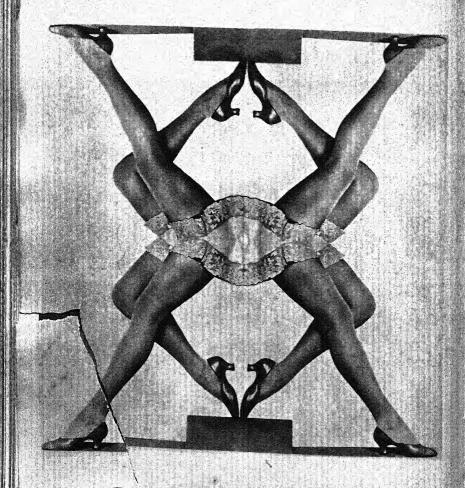
GLADSTONE ADAMS

MAURETANIA LEAVING TYNE ON HER MAIDEN VOYAGE, 1907



ORTRAIT OF R. N. HAILE, ESQ.

FORD



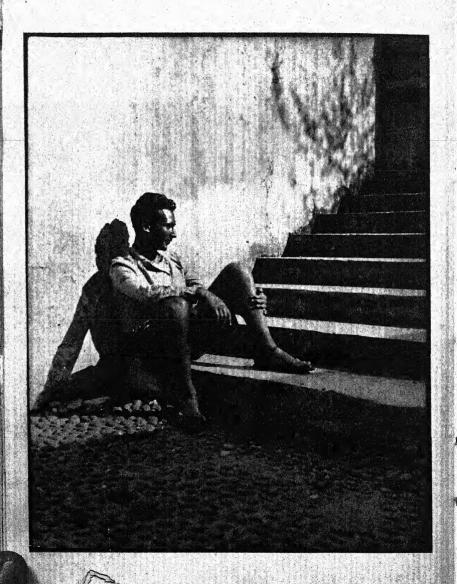
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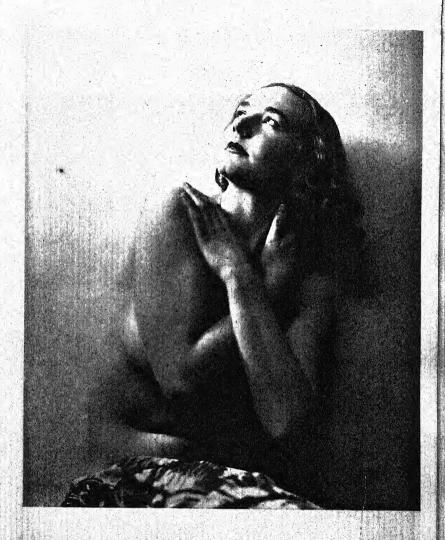
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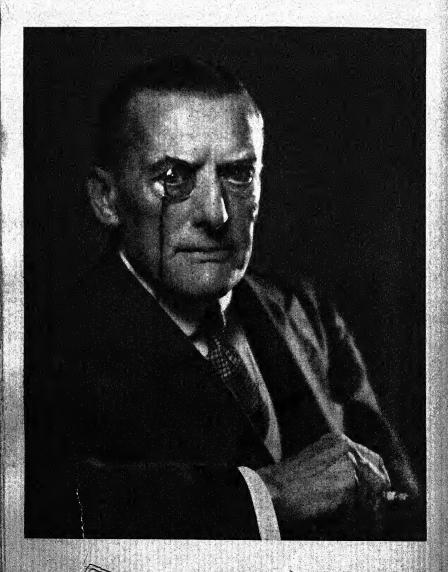




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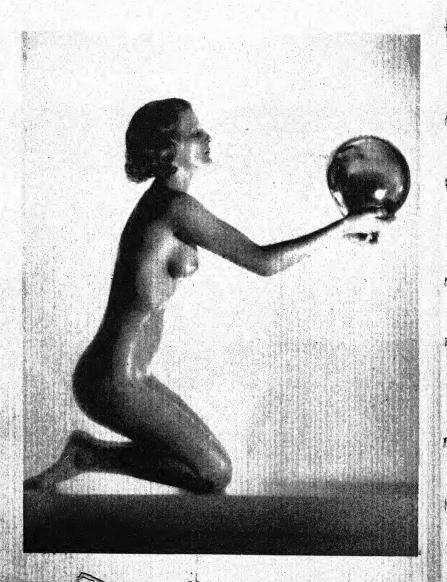


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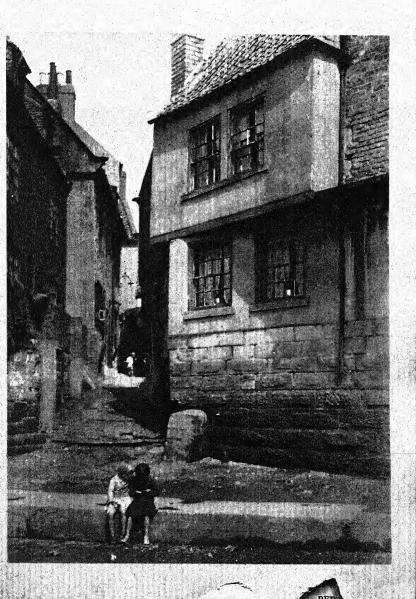
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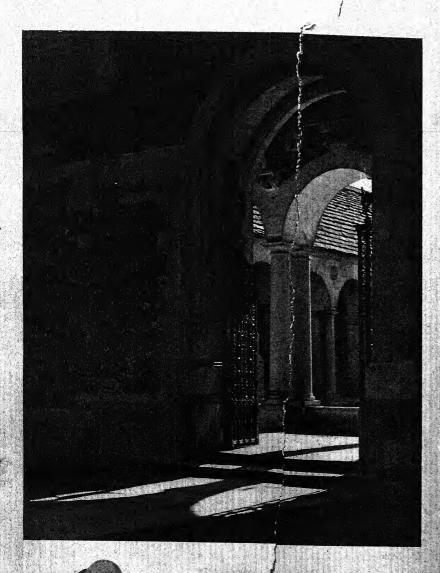


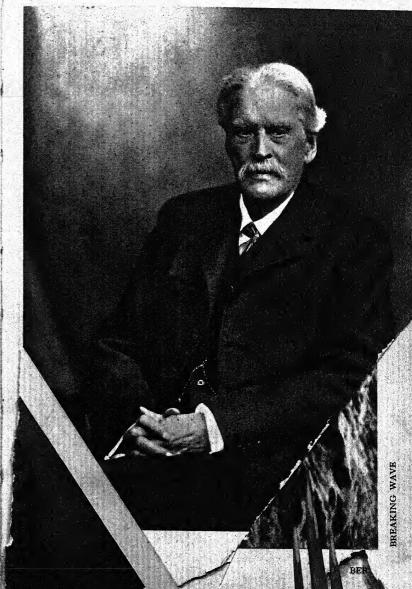
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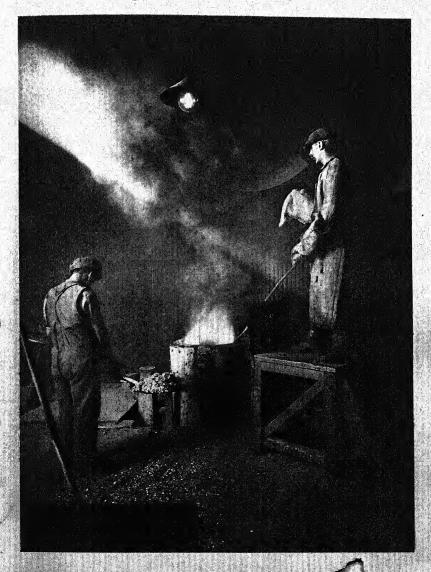




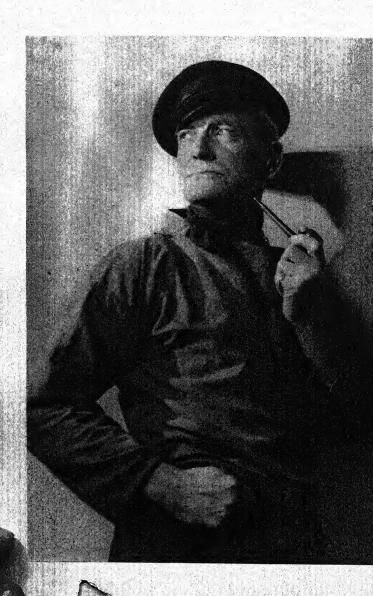


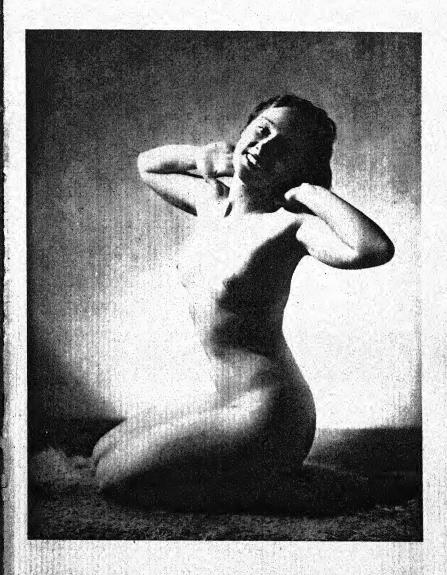


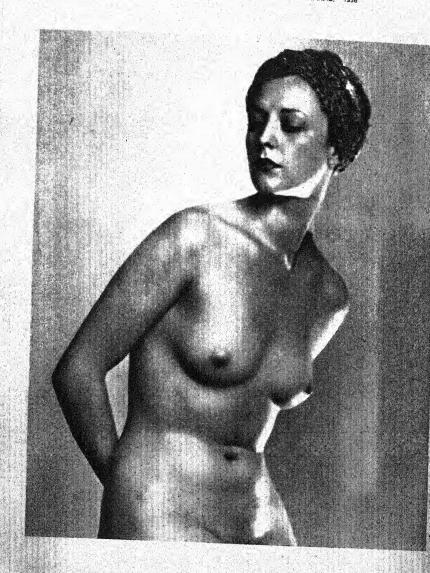




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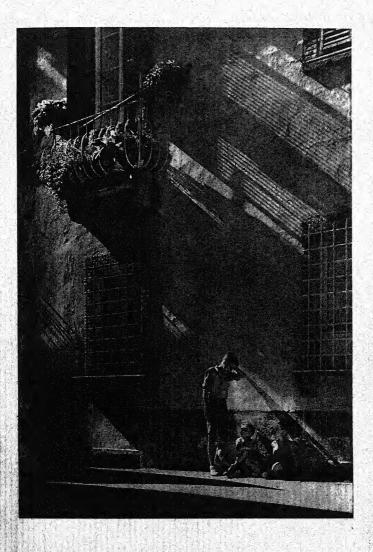




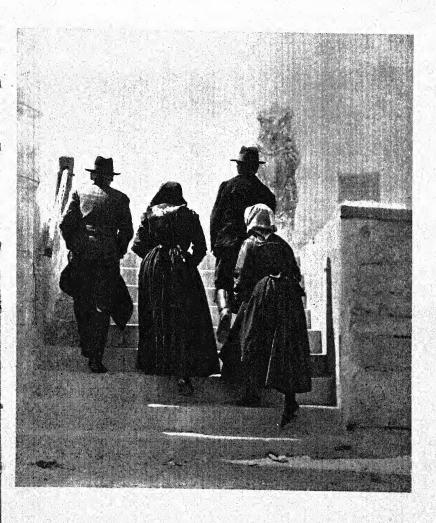


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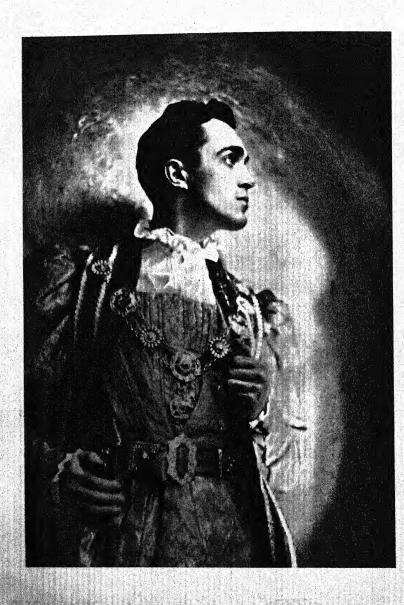






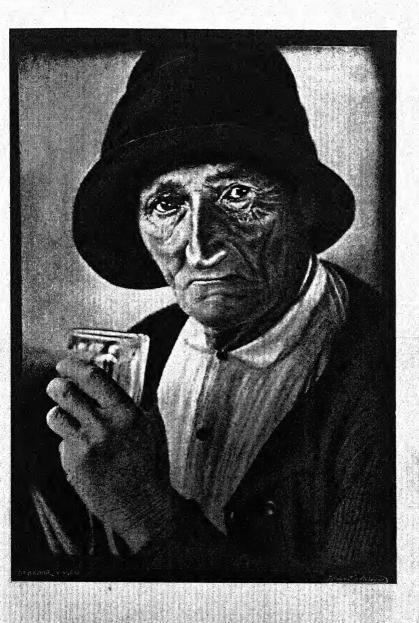


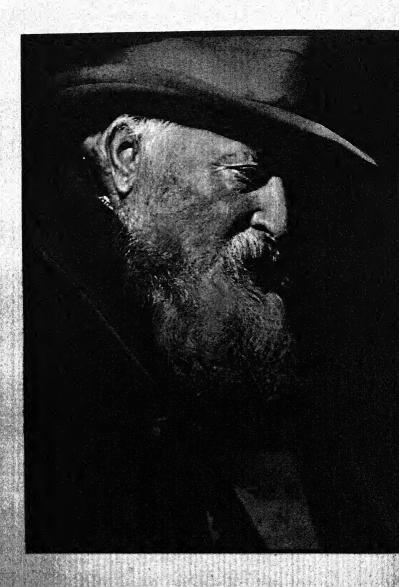




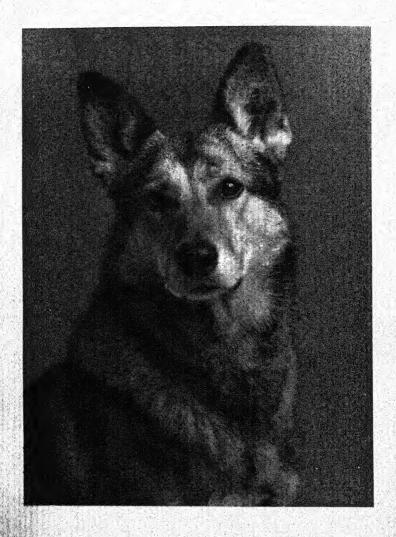












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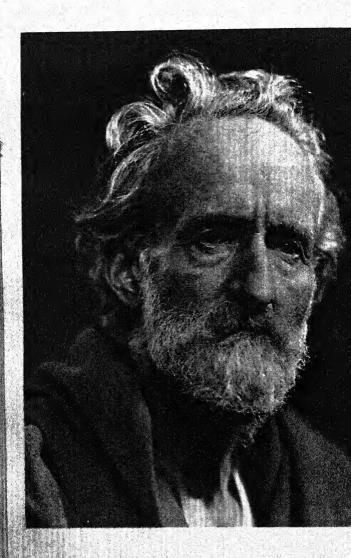


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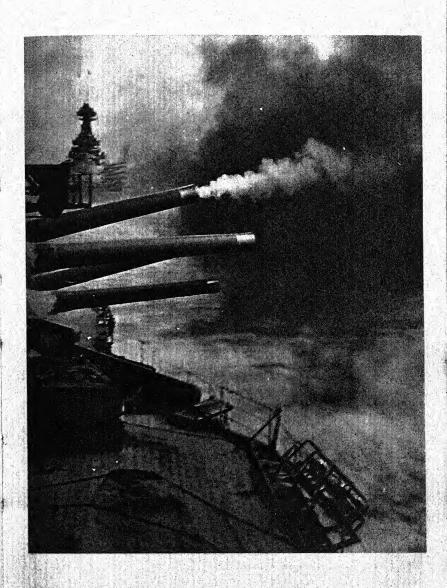
A. DENNIS, ESQ., J.P. (AGE 96)

H. W. LAMBERT

HAPPY DAYS



HEAD OF AN OLD MAN

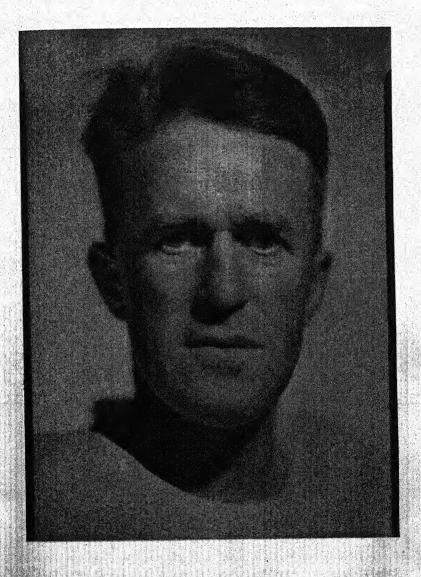


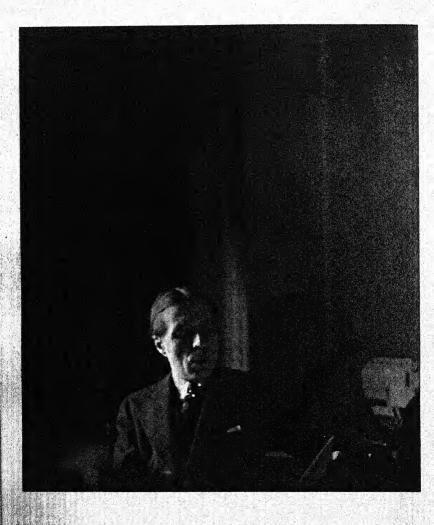
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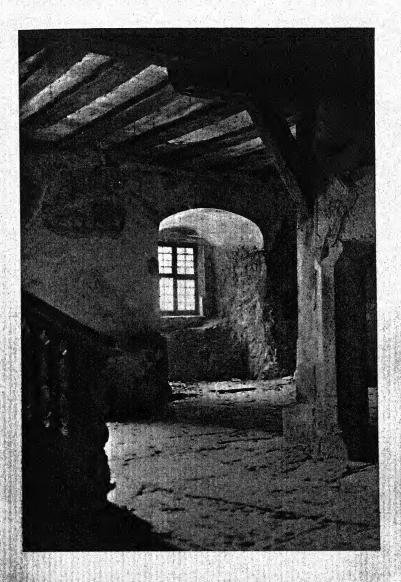
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F. J. MORTIMER









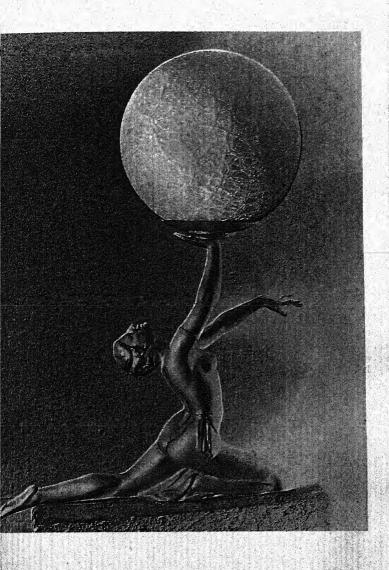


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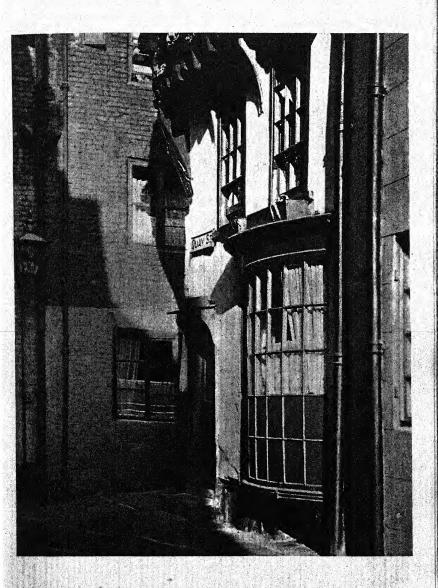


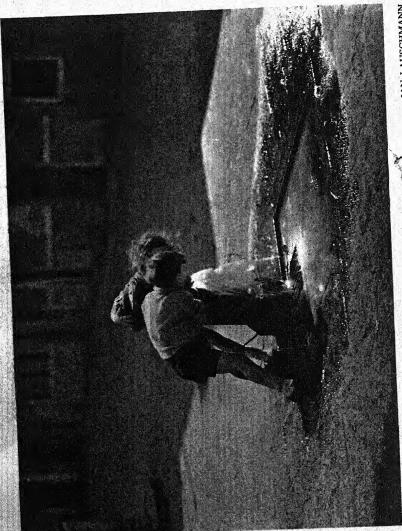
POISE



EDWIN BROOMER







SUCCESSFUL AMATEUR PORTRAITURE.

By C. W. MARTIN.

"The proper study of mankind is man," and sooner or later most amateur photographers feel the urge to take up serious portraiture. To do so successfully necessitates little monetary outlay, provided one already possesses a fairly good camera, but it does require that careful consideration be given to certain factors.

Since there has recently been some controversy regarding the type of lens most suited to portraiture, a few remarks on cameras generally will not be amiss. Almost any camera fitted with a good focussing anastigmat can be used; my own favourites are an Ikonta giving sixteen exposures on a $2\frac{1}{4} \times 3\frac{1}{4}$ ins. roll-film, and a $\frac{1}{4}$ -plate reflex. The essential point is that the lens must be capable of being accurately focussed upon the features that are to be dominant in the finished portrait; a large aperture, while not absolutely necessary, is a great asset, since it means that exposures will be short, and that non-essentials such as the background will be well out of focus: f/4.5 is a very useful aperture. For ease of operation the reflex is probably the best, since a fullsize image of the sitter can be examined right up to the instant of exposure, which greatly assists in arranging a pleasing composition and securing a characteristic expression.

It is contended by some that the definition of an anastigmat is too "sharp" for portraiture, and for those who desire a "softer" image without the expense of a special lens, the fitment illustrated in Fig. 1 will give it. This is a disc of fairly thick celluloid or Cellophane with a pear-shaped hole in the centre, which is mounted in front of the lens like a



Fig. 1.

filter. The material must be colourless but need not be flawless; in fact, a slight unevenness of surface is an advantage. An alternative is the well-known "Flou-net" screen designed by M. Misonne; this works on the same principle and has the added advantage that the degree of softness can be varied within wide limits. This question will receive

further consideration when dealing with enlarging.

A most important factor is the ratio between the focal length of the lens and the length of the room in which it is to be used: a table will be found in this Almanac.

Any room in which an uninterrupted space of ten feet or more can be arranged can be used for head-and-shoulder portraits with lenses of focal length up to six inches; the shorter focal lengths will naturally include more of the sitter at any given distance. Excellent all-round work can be done in a room fifteen feet long, with a lens of 41 ins. focal length covering a plate $2\frac{1}{2} \times 3\frac{1}{2}$ ins.

Thanks to the introduction of half-watt lamps of the overrun type, the problem of lighting is now comparatively simple; but many amateurs are not making the best use of them. The majority merely insert them in the domestic electrolier or lamp standard, and subsequently wonder why their portraits do not resemble the professional product. They overlook the fact that, whereas house lighting is designed to give overall illumination, studio lighting requires to be concentrated upon the sitter. To this end I have evolved certain very cheap but very effective pieces of apparatus.

For top-light the normal ceiling bowl is removed and the fitting illustrated in Fig. 2 is substituted. This is of strong cardboard. The whole of the inner surface is covered with silver-surfaced wall paper. A hole at a suitable point takes the normal light socket, into which is plugged a

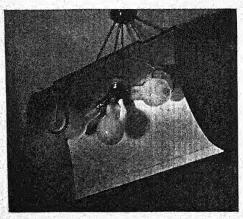


Fig. 2.

three-way adaptor, accommodating three Photoflood lamps as shown. Two cheap cycle mirrors, rods bent, are fixed to the top; these can be swung in front of the side lamps to give indirect lighting, or to the back to give direct lighting with added reflection. Along the top and bottom edges of the reflector are fixed series of screw-hooks, by means of which the light can be hung so as to shine in any direction; a silk diffuser can also be fitted. The dimensions of the reflector are not important, provided that the lamps are adequately housed and

the light thrown forward and downward.

Fig. 3 shows a portable lamp which supplies the main source of light and controls modelling; the reflector is a solid aluminium bowl costing about 4s. Three holes are drilled in the bottom, into which three lamp-sockets are fitted, taking three Photoflood lamps. Short flexes from the sockets are fitted with plugs which engage with a three-way plug, to which the current is carried from a wall-plug by "cab tyre" flex, via a push switch. Three short Meccano strips are fixed at equal distances round the circumference of the bowl, and carry a large embroidery frame of roughly equal diameter; the space between the bowl and the frame is covered with a strip of cardboard, silver paper lined as described above. A similar frame holding a ninon diffuser can be arranged to fit over the front. The complete lamp is mounted on a tripod with a ball-and-socket head, by means of which the light can be directed in any direction.

The third lamp is a standard Matelux with reflector and stand; this is chiefly used as a backlight. A large toffee

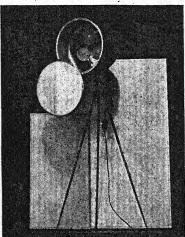


Fig. 3.

tin from which the bottom has been cut is sometimes slipped over the reflector in order to localise the light. The appearance of all these lamps is greatly improved if their outside surfaces are painted to tone with the general furnishings of the room.

With these three units practically any effect can be obtained without trouble, but the worker who is not familiar with half-watt lighting is advised to try various arrangements before undertaking a sitting, using ordinary lamps and a

patient model. He should bear in mind that the power of half-watt light is governed by the law of inverse square ratio; this means that the effective power of a lamp two yards from the sitter is only one quarter of what it would be at one yard. As conditions will vary in every case, it is impossible to lay down any definite rules for exposure; as a guide, the following table gives some of my own used at actual sittings, with lighting schemes similar to that shown in Fig. 4.

f/3.5Emulsion. f/4.5Ilford Hyper. Pan. Plates Agfa Superpan. Plates 1/251/15 1/10 sec. Kodak Super. S. Pan. Film ... Ilford S.G. Pan. Plates 1/151/10 1/5Kodak Panatomic Film 1/51/10

Shorter comparative exposures would be possible with all the lights in front of, or closer to the sitter, but neither course is advocated since both tend to destroy modelling and cause discomfort. A better method is to light the shadows by means of reflectors, and very effective ones can be made from sheets of three-ply wood, covered on one side with the silver wall paper; two can be seen in Fig. 3.

So much for the actual taking; now comes the processing of the negatives and the making of the final prints. In

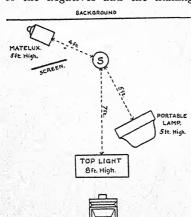


Fig. 4.

portraiture, more than in other branches of photography, it is often an advantage to be able to develop the negatives of a sitting at once, which necessitates permanent darkroom. In the modern house this is generally somewhat of a problem, but in my own case I solved it by annexing the clothes closet under the stairs. This is merely a cupboard three feet square by seven feet six inches high, but as it has a door that can be locked and no window, it answers very well; Fig. 5 gives a disgrammatic view.

At a distance of 18 ins. from the ceiling is a shelf, 7 ins. wide at the sides and 14 ins. along the back; this is made from 3-in. wood and supported upon strong brackets, as it carries a considerable weight of chemicals and stock solutions. It is stained a dark shade, to preserve the wood and prevent light-scatter when en-Two batten-sockets are fixed under the shelf and a larging. switch-plug to the left-hand wall; all main leads are provided with fuses, so that a "blow-out" in the darkroom cannot affect the house lights. The batten-sockets have built-in switches, and into them are plugged two-way adaptors, one point of which has an independent switch. These are permanently fitted with red, amber and green photographic lamps, and a low power white one, the latter having a small shade to protect the operator's eyes; thus, a turn of a switch gives a safelight for whatever work is in hand. The small electric heater under the bench is connected to the switch-plug via an independent switch; this keeps all solutions at an active and even temperature during cold weather.

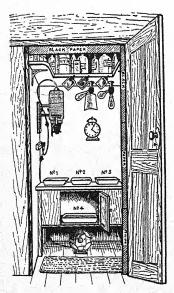


Fig. 5.

The enlarger is a Zeiss Mirax lamphouse to which any camera up to 1-plate can be quickly attached; for portraiture it is essential to use one with a really good lens. In my own case a spare camera with a good anastigmat is permanently in position, but if an ordinary plate or roll-film camera is used for the taking it can also be used for enlarging, which effects a saving in outlay. In fitting the lamphouse to the wall, care must be taken to see that it is absolutely vertical, that the camera when fitted is square with the bench, and that in the highest position the enlarger does not touch the shelf. The lead, carrying an independent switch, is plugged into the wall-plug.

In order to make the room quite light-tight some large

sheets of stout black paper were cut into strips about 6 ins. wide, folded in half length-wise, and fixed inside the door

frame along the top and sides, so that they fold against the door when shut; a small mat cures any leak at the bottom. Finally, a cheap clock with large black hands and figures is hung immediately under the lamps; one with luminous hands

and figures would doubtless be an improvement.

Although the dimensions of this darkroom may seem very small, it has proved quite adequate for all work up to whole plate size. For the processing of negatives, the enlarger is raised as far as possible and the solutions arranged as shown; No. 1 desensitiser, No. 2 developer, No. 3 rinsing water, and No. 4 the fixing bath in the cupboard under the bench. As soon as the negatives are in this latter, the cupboard door is shut, and one is free to emerge from the darkroom. The fixing of roll-films must be done on the bench, unless the roll is cut into short lengths. Washing is done in the domestic sink, and film negatives hung to dry from clips along the edge of the shelf; plates are placed in a rack on the bench.

For enlarging up to whole plate, the easel is placed upon the bench, while two dishes to the right of it contain the developer and rinsing water respectively, the fixing bath being in the cupboard, as before. For larger prints the darkroom can only be used for the actual projection, the processing being done elsewhere; however, as \(\frac{1}{2}\)-plate and whole-plate are the usual

sizes for portraits, this is no real disadvantage.

Reverting to the question of "softness," this can be introduced into a print from any negative during the enlarging. The screen shown in Fig. 1 as well as the Misonne screen can both be used, or the worker can design screens of his own; "bolting silk" and chiffon are not recommended for portraiture, as the degree of diffusion that they give is somewhat too great in most cases. There is also the Kodak Diffusion Portrait Attachment, which is a supplementary lens with three grooves polished upon its outer surface. This is very useful in enlarging as it gives a very pleasant soft-focus effect, and has the added advantage that by shortening the focal length of the enlarger lens, a larger image can be obtained at any given setting. The degree of softness given by any of these means can be controlled by the lens diaphragm; the smaller the stop used the sharper the image.

With the equipment herein described, the cost of which is very moderate, the amateur will find that he can make really good portraits. Moreover, as he gains experience and confidence in this most fascinating branch of photography, other methods and appliances will occur to him, by the use of which he will be able to increase his scope and perhaps effect a saving

in time and effort.

EXPERIMENTING IN PHOTOGRAPHY

By DAVID CHARLES.

Experimenting may be regarded as bearing some likeness to certain kinds of food; either we like it, or it is good for us. Happy indeed is the man who not only enjoys experimenting but who can also derive financial benefit from it. A distinction should be drawn between experiment and invention. Experiment may lead to invention, and invention can rarely be achieved without a very considerable amount of experiment; far more, in fact, than most people appreciate who regard an invention as a sudden bright idea which comes out of the blue to bring fortune to the person whom it suddenly and unexpectedly strikes.

But a very great deal of experiment has nothing to do with invention, in the sense of evolving entirely new apparatus or processes. An experiment, or series of experiments, may be performed for the sole purpose of ascertaining a fact. For instance, we might be desirous of knowing just how many prints of a certain size can be properly fixed by a given amount of hypo: or again, we may wish to discover just how a certain lighting effect can be obtained, or how a recurrent trouble

can be cured.

There is, of course, the kind of experiment which can best be described as "I wonder what would happen if-". This is a very risky and nearly always profitless form of experiment. The schoolboy who places a bent pin on the master's chair is not experimenting at all. He knows what will be the probable result, and is merely betting on escaping vengeance. But when he tries the effect of various alleged deodorisers in order to disguise lingering traces of illegal nicotine, he is undoubtedly experimenting, though scarcely on entirely original lines. He is making experiments for the sake of attaining a desired end. The experiments themselves give him no joy at all, whereas the lad who places a goldfish in a bottle of sulphuric acid, or who hangs a candle up by its middle and lights it at both ends is giving vent to the spirit of adventure in his experiments. The resultant thrashings, in the one case for alleged, though unintended, cruelty; and in the other case for equally unintential ruination of his father's choicest Persian carpet, can never quite cancel out the ecstacy of the experiments themselves. Similarly in photography an experiment made on the spur of the moment just to see what will happen must nearly always be regarded as an end in itself. If it is intended to have any other end the chances are that it will not, but if there is any it may be a tragic one like that of the operator who struck the bright idea of taking the freckled bride's portrait on process plates, "just to see what would happen!" If the reader desires to get the fullest enjoyment of this notion, he must please just repeat that same experiment for himself. But he should play for safety, and expose a couple of "pans" in addition. Never, if you do photography for a living, experiment on a job, without playing for safety as well; and if you are an assistant, never experiment on the firm's work, "just to see what will happen." It will probably happen on Saturday, or possibly sooner.

I am not going to say that haphazard experiment never "strikes lucky"; one in a million does, and investigation will usually show that the man whose bright idea turns up trumps has gone through a long mental list of logical possibilities and of likelihoods before he makes his practical experiment. The man who feels a sudden hankering to dig for gold is usually, if truth must be told, feeling the desirability of the gold more strongly than the need for muscular exercise. So he does not just rush out somewhere and dig a big hole. He studies where gold is most likely to be found, how best he can get there, and what tools he will require. Similarly in photographic experiment—and photography would be non-existent without it—far more is achieved by sorting out the possibles and probables in advance than by chance shots.

With all the care and calculation and labour that can be put into experimenting, it can be terribly disappointing. Although no progress can be possible without it, the mortality of experiments is tremendous. It has been said that if every fish-egg resulted in an adult fish the sea would have long ago been solid with them; that only one bullet in a hundred-thousand fired ever hits a man; in much the same way it is by no means necessarily the first thing tried which proves the correctness or incorrectness of an idea, or the practicability of a device. For instance one might think, though not with absolute originality, of course, that density in a negative could be locally increased by means of an air-brush, either on the back or on the emulsion side. The first attempt or two might easily suggest that the idea was unworkable, especially were it on a sheet of glass that the experiments were made. But after trying various modifications of treatment, both as regards the adjustment of the tool itself and the kind and

strength of the colour, and after some practice had given some skill and confidence in the manipulation of the instrument, the experimenter would begin to realise far greater possibilities than the mere idea of strengthening of weak densities with which he commenced. Not the first tentative experiment, but the cumulative effect of many, brings about such a result.

Experiment of any importance should be undertaken only in a proper systematic fashion. The idea of imitating or improving upon a given lighting has already been quoted as a subject which frequently calls for experiments. Such an occasion might easily be regarded as a very suitable one on which to use up a sample lot of films. The latter, having cost nothing, would not involve loss of cash if the results proved unsatisfactory. The fact is, however, that the results in such a case are only too likely to prove disappointing, or at the best misleading, simply because the problem of a different lighting scheme is complicated with the additional problem of an unfamiliar translation of tones.

Moreover, such experiments in lighting, and indeed any others which appertain to the artistic side of photography, should be entered upon with just as much logical analysis of fact as those which deal with chemical and technical matters. In this connection we may recall with advantage the long struggle which beset photographers when they first attempted to obtain results with the arc lamp such as they had previously been used to producing under a large skylight. It was literally years before the simple fact became generally realised that a screen of muslin in front of a point-source of light could not possibly transform it into anything approaching a parallel beam of several yards square, and that consequently an entirely different technique would have to be evolved. The logical system of an illuminating engineer's experimental laboratory would have involved making diagrams, both sectional and plan, of the studio, with lines indicating the source and direction of light upon the sitter. Superimposing upon such a drawing a point representing the proposed position of an arc-lamp, from the diffuser of which again lines were drawn towards the sitter would demonstrate in five minutes the total impracticability of reproducing the same type of "distribution" by the new light-source.

I have never been among those who suggest that the training of a photographer should include courses of instruction in chemistry and optics, and the fact that most successful photographers are totally ignorant on these matters is sufficient argument on the point. But if a photographer desires to make experiments involving either of these sciences, he is

indeed courageous to embark on them without at least some real technical knowledge on the matters he proposes to dabble The experienced experimenter knows only too well the pitfalls which beset the explorer in untrodden fields. His most valuable assets are: infinite patience and the faculty of learning and remembering the peculiar idiosyncracies of hosts of things; thirdly, he does not take it for granted because his first attempt fails that his notion is wrong. An actual example which well illustrates this point occurs to the writer in connection with his first attempts at enclosing the smoke of a Well over thirty years ago he was struck by the desirability of achieving this, which was certainly a greater desideratum with the powders of those days. Pocket-money was saved until the price of a sparking-coil and battery was reached, and many were the jam-jars which "went west" when the device decided to work. The principle was evidently right, but it was many years before better knowledge of electricity and of explosives produced a reliable apparatus. Looking back upon some of the other items of knowledge gained in the course of experimenting gives reasonable cause for wondering at the survival of the gainer. Consider the tremendous possibilities lying latent in a half-pint of sulphuric acid, for instance, that innocent-looking, syrupy fluid which was once the fashionable thing for over-emotional lovers to throw at one another; no need, if in search of excitement, to join the Foreign Legion; just let the tap dribble into the beaker of acid, and create more employment for tailors and beauty-doctors! In the course of studying acetylene, as a studio illuminant, it was learned from a text-book that it becomes explosive on dilution with considerable quantities of common air. But that it can lie invisibly in wait for days for a man with a candle was only discovered at the cost of temporary disfigurement, with the narrowest escape from blindness. Experimenting in such efficient bleachers as bromine and chlorine has many equally unpleasant possibilities. The latter is a gas, much used in modern warfare, which can be seen to roll in yellow clouds from a little permanganate of potash on crystals of which a small quantity of spirits of salts is dropped. For the sake of health, as well as that of sensitive films and on behalf of domestic peace, this experiment should be tried out of doors, if at all. It will probably destroy more insects than it bleaches bromides, but it may at the same time (as the writer once found) exterminate the chrysanthemums and the spring cabbages ... in fact the whole garden may turn mustard colour overnight!

But experimenting is by no means all romantic and unfamiliar. Every photographer carries out experiments, often without being conscious of the fact. For instance, when a new camera is bought he experiments in the handling of it, frequently much in the same way as a child with a new toy. Far better to take the thing logically, one thing at a time, and in the right order. How does it open? Close it again. Now open it again. How does it focus? Now focus it for several distances. Go through the whole series of operations in the same order as though actually taking photographs, instead of the usual plan of trying the clever fittings first! After five minutes or so he is ready to use the camera as though he had had it for years, and he will not have missed the little snag that might have lost a picture. That simple example typifies the only practical way of getting results most surely and most quickly in experimenting of any kind whatsoever.



Fig. 1.

There is nowadays little room for experiment in the use of colour-selection filters. Manufacturers have done it all for us, and their knowledge is placed at our disposal with great lavishness. The great British emulsion makers will even supply special filters and special emulsions for unusual purposes . . . and all we have to do is to use them as directed. Of course there are people who like to try one firm's films with another firm's filters, but that is a wasteful form of experi-

menting in which better results are always doubtful. Colour photography is still an avenue for experimenting for the man who has ample time and money, and to whom the hunt is

more important than the quarry.

Enough has been said, probably, to show that when experiments are embarked upon in order to improve existing matters, or to evolve new ones, the mind should be kept fully open to the possibility of having pre-conceptions destroyed and replaced by new ideas. Nor should the results of experiment be too lightly taken as proof of any fact, unless the conditions have been so carefully arranged as to rule out the possibility of an unobserved factor having crept in. Photography is such an involved affair that it is fatally easy to attribute to one cause the effects of something quite different.

Fig. 2.

There is of course a powerful volume of experimenting done simply and purely for the sake of experimenting. What proportion of the total that kind represents it is scarcely possible to suggest but it is certainly large and it may be regarded as a hobby which is at least as harmless as any other, while it has the advantage of exercising the mind more actively than There are many. always plenty of avenues for simple kinds of experiment for those whose

urge does not of itself take any particular definite direction. New tones for prints, different styles of mounting from the excellent, but somewhat standardised, fashion of to-day; fresh applications of photography altogether! The mind might be allowed to dally, for example, with ideas upon combined development and fixation. Not necessarily in the already well-trodden, and rather unfruitful field of a single solution, but

in the direction, perhaps, of a tank which automatically exchanges the solutions at a predetermined moment, or a package which releases a rapidly dissolving fixer after a certain fixed interval. The reader may like to note that plates with a developer incorporated with their backing have already been tried. How practical they proved he does not know. But it is always well for the keen experimenter to remember the fact, so well put to the writer by a "big business" man in the following words, that "a thing which is desirable is not necessarily commercial." If the experimenter succeeds in evolving something which, so far as he knows, has not been previously known, or done, his satisfaction in that fact should be regarded as his greatest reward. Fact compels me to state that experimenting may be likened to shaking a mountain, from which gigantic process may, if one is fortunate, sometimes issue a very small brown mouse. But it is certainly something to be able to shake a mountain!

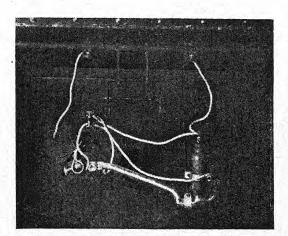


Fig. 3.

The one great branch of photography in which still lies the greatest scope for experiment is that of lighting. Light is the photographer's principal tool, but one which takes so many forms, and which behaves in so varied a manner on differing types of subject that it is never quite mastered. Even the same subject may appear an entirely different one under different lighting, as any debutante knows who emerges

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from a Bond Street studio to face a pressman's flashbulb. It is by no means only a face which assumes different characteristics-one might be tempted to say different charactersunder various forms of lighting. The landscape worker knows this, and takes advantage of it, though he cannot control his lighting. But the possibilities of experimenting in indoor lighting are almost infinite, either to the man who wants to make his subjects look technically interesting, or to him who makes pictures. A little shine here, a shadow there, and what a difference to the result!, But just where shall the shine or the shadow be? For each and every subject there is a different place. That is why experiment in lighting is never finished. It is by no means an easy subject upon which to produce illustrations, first because so many experiments

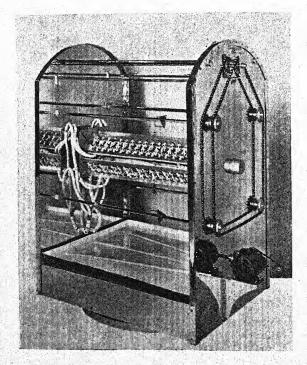


Fig. 4.

do not result in actual pictures which demonstrate their experimental side, and secondly because most experimental illustrations would be unintelligible without considerable individual explanation. But I have selected a few examples of photography in the making of which the necessity for experiment was found to be necessary, and of other simple subjects which may suggest avenues for fresh experimenting

by others.

Photomicrography is a branch of photography which probably more than most others calls for the spirit of experiment in its practice. Here are a couple of examples, figs. 1 and 2, which well exemplify this fact. The photomicrograph of skin on the sole of the foot of a living child called for experiment in every stage, from selection and arrangement of apparatus and subject, down to choice of lighting arrangements, filter, materials, and subsequent procedure to obtain a sufficiently defined and bold result. The splinters of metal shown in fig. 2 were comparatively simple to magnify in the camera, once obtained, but took a considerable amount of research to discover a method of finding and filtering them from the thick grease of a car engine.

In the case of the subject shown in fig. 3, numerous experiments were required in order to establish data on which to determine the correct materials, apparatus, exposure and other details required for photographing a mercury-arc for the investigation of fluorescence, too bright, for the human eye; and then again for photographing the fluorescent samples of olive oil and other drugs under its radiations when the visible rays were filtered out. For this, no practical data

appeared to be on record.

The subject of fig. 4 appears, by contrast, to be a very ordinary commercial photograph. It is a large roasting-machine constructed almost entirely of stainless steel, which is a perfectly mirror-like metal, and which, by the way, will not take putty in the same way as silver, even if one ventured to attempt applying putty evenly over such large areas. Apart from the difficulty of photographing a "light" subject effectively against a light background, if the reader thinks he can photograph such a subject satisfactorily (in the machine-shop and without recourse to any more retouching than blocking-out the box on which the object stands) without a certain amount of preliminary experiment, I am prepared to take off my hat to him.

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THE FILM AS A RECORDING MEDIUM

By STANLEY W. BOWLER, A.R.P.S.

Scientific advancements in film technique would most probably be credited to the insistent demands of the theatre film in a continuous endeavour to increase its attractiveness to the senses of the normal cinema patron. The financial importance of this particular branch of the industry, and the fact that the major portion of labour of every type and rank concerned with cinematography is engaged in it, tends to

overshadow other developments in the art.

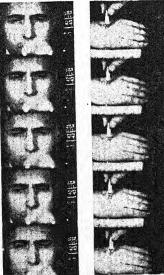
Film apparatus and accessories were primarily designed for the solution of problems, scientific and otherwise, which were not capable of being dealt with so effectively or completely in any other manner. From these small beginnings the cinematograph was seized upon as a new means of entertainment-its crudities had to be eradicated in order that it might prove to be a commercial proposition, and then, as it progressed and audiences became more exacting in their demands for realism, sound was added, and now in order to maintain the interest of the general public, the visual image which speaks is coloured. Whether this visual image, in black-and-white or in colour is an exact record of the original or whether the sounds accompanying it are a true reproduction is not strictly material provided that the whole forms a harmonious and pleasing contribution to the amusement of the cinema-patron. It might then be said with some truth, that the principal use of cinematography is not bound by any limitations of accuracy in recording or reproduction. And thus, so far as scientific progress is concerned, it is of little value, apart from an indication to future generations of the pleasure indulged in by their forbears—should any of these records escape the natural destructiveness of mankind.

The early history of the film is to a certain extent still a controversial matter, but the first attempts at recording motion for investigatory purposes can, I think, without fear of contradiction, be said to have been for technical reasons, rather than for any hopes of financial rewards from amusement revenue. Due to a new demand from the public for short programmes of a specialised type, the less technical of record films, with the addition of dramatic editing, are receiving a

certain measure of publicity, but by far the greater part of this really valuable work remains shrouded in obscurity. It is not until the research work is of such a spectacular nature that it is fit for newspaper presentation and embellishment that the general public is permitted a peep behind the scenes. That it is, frequently, an ill-informed and inaccurate peep is

of little moment to the reader.

Dr. Peter Mark Roget's theory of the "Persistence of Vision," published about 1824, is probably the first contribution to the beginnings of cinematography, although it was not until the perfection of celluloid coated with an emulsion that these early beginnings began to grow out of the purely experimental stage. Following upon this statement of fact various pieces of apparatus were devised exploiting it. Sir John Herschel's "Thaumatrope" and Dr. Horner's "Zoëtrope" or "Wheel of Life" grandly called the "Dædaleum" were among these,



Courtesy Western Electric Fig. 1.

followed by others with such queer sounding names as the phenakistoscope" and the zoöpraxinoscope." desire of these early experimenters was to build up an illusion of motion from stationary pictures or drawings, and this culminated in the use of individual photographs by Henry Heyl of Philadelphia, in 1870, in the Phasmatrope " in which these individual pictures were viewed in rapid succession.

Two years later, in 1872, Edward Muybridge, of San Francisco, was working along the reverse lines, ing photographs in rapid succession in order that they might be viewed individually at leisure to analyse motion rather than with the hope of synthesising it

again. A year later he went to Paris to visit Meissonier and acquaint him with his researches. The next we hear of the analysis of motion is in 1882, when Dr. E. J. Marey perfected his photographic gun, using circular glass plates, and with 212

which he made a number of exposures on flying birds, etc. Four years later he had completed another device similar to an ordinary bellows type camera, but with an internal rotating shutter.

In 1885, Eastman of Rochester had laid the real foundation

stone of cinematography proper, in starting the practical manufacture of the first successful celluloid films, but it was not until 1889 that the first length of celluloid film for any produced. camera was cinematograph Edison's "Kinetoscope," shown at the Chicago World's Fair in 1893 used the new film material, and from this time onwards the progress was rapid and rather startling-although nothing actually was invented, rather the various parts of the apparatus necessary were improved and perfected little by little. As regards the projection of films an invention by Pross in 1903 of the three-bladed projection shutter at last removed what had previously been a serious drawback to viewing these records in comfort, in the flicker due to the picture movement between the periods of rest.

The main essentials for photographing and for projecting movement were now complete, even though in many respects they were still crude. By photographing at a high speed and projecting at the normal speed of sixteen pictures per second it was possible to slow down the original motion,



Courtesy Western Electric Fig. 2.

and by photographing slow moving objects at spaced intervals and then projecting at the normal speed of sixteen pictures per second it was possible to accelerate the original motion. The facilities available soon attracted the keen analytical minds of the medical profession in their search for the sources and cures for diseases, and their investigations into phenomena that they were not able to study by any ordinary means. It placed in their hands a means of recording phases of their studies of which they had previously only been able to make sketches, and these obviously depended upon the individual skill of the investigator and were thus likely to be misinterpreted by others.

They coupled to the cinematograph camera their most valuable tool, the microscope, and thus carried the film into

yet another field. Dr. Comandon and the French company, Pathé Frères did a great deal of work along these lines on blood corpuscles and watching blood infected with the trypanosome of sleeping sickness. Perhaps it is not strange then that one of our modern research workers, Dr. Canti of St. Bartholomew's Hospital should have devoted so much time and patience to this aspect of medical investigation.

Along what has turned out to be more popular lines Percy Smith's "Secrets of Nature" films have provided botanists and teachers of natural history with an invaluable means of showing exactly what happens during the growth of various plants. In the same way, Edwin and Williamson have carried out exhaustive enquiries into submarine life in West Indian waters, with special apparatus, using Cooper-Hewitt quartz lamps for illumination in the depths.

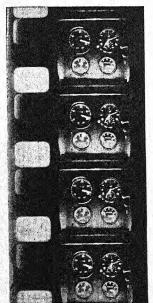
Perhaps the most important of any cinematograph apparatus for investigatory purposes is the high speed camera. One of the earliest genuine records comes from the Marey Institute in Paris, who have done perhaps more for the advancement of cinematography than any other single institution. Nogués and Lucien Bull used a continuous drum type camera with a commutator built on to the shaft to give intermittent lighting. With this apparatus they succeeded in taking pictures up to the rate of 240 a second. To this they also added a second lens and film system for stereoscopic work. Later, in the period 1914—1918, the Marey Institute and Lucien Bull did more useful work on projectile investigations on behalf of the Allied governments. The Eastman Research Laboratory in America had also devised a similar drum type camera for recording ordinary camera shutter speed tests.

The latest contribution to this general group of cameras is the Western Electric High Speed Precision Timing camera, which can take up to 2,500 pictures per second on 16 mm. film stock, and at the same time make a time-record of a clock reading to one-thousandth part of one second. In this way the investigator can check his permanent records against a simultaneously recorded time base. Various types of records that have been made are illustrated in Figs. 1 & 2. The pictures of the hand and the face are records of nerve reactions; in the first case the hot end of a cigarette is placed in close proximity to the back of the subject's hand, and the time taken for a reaction can be read off on the clock image and in the second case the time of the eyes shutting due to a flashbulb discharge can be similarly told. Fig. 2 shows the start of the burning of an ordinary flashbulb and also the termination, so that

the duration of the "flash" can be determined to the order

of one thousandth part of a second.

The film can also be made to record a number of instruments which cannot be watched by a human operator during a test. Advantage was taken of this in the record run of Sir Malcolm Campbell's Blue Bird racing car, when the driver had more than enough to do without having to watch and memorise the readings on four dials. This particular record which was made on a Kodak 8 mm. camera specially adapted, is shown in part in Fig. 3. During an investigation into the determination of the lower limit of natural illumination for clerical work, L. H. McDermott of the National Physical Laboratory used a cinematograph camera to record various instruments, the readings of which it was necessary to have in order to complete the



Courtesy Kodak Ltd. Fig. 3.

about 30 feet of 9.5 mm. film. Finally, the use of film in psychological investigations cannot be overlooked, although the reticence of the makers of these records is not easily understand-It has been almost impossible, without relying upon hearsay and second-hand information, to gather together any reliable information upon That much useful the subject. work has been done, and is still being done is not questioned. Perhaps these investigators, or what is more likely, their sponsors, will see fit when the credit for all this type of work has gone to other and less illiberal countries, will be willing to disclose the results of their researches, and thus further the general dissemination scientific knowledge.

data required. The whole record was spread over six months or so, and was compressed into

OBITUARY:

Among those whose deaths have taken place since the I935 volume of the British Journal Almanac was closed for printing are:—

R. Child Bayley (November 29th, 1934).

James Brown (December 6th, 1934).

Alexander Corbett (January 21st, 1935).

J. E. Hodd (January 29th, 1935).

Lieven Gevaert (February 2nd, 1935).

J. H. Agar Baugh (March 8th, 1935).

Alfred Watkins (April 7th, 1935).

C. F. S. Rothwell (April 18th, 1935).

Dr. John Hertzberg (May 15th

Dr. John Hertzberg (May 15th, 1935).

F. T. Usher (June 14th, 1935). William E. Gray (September 4th, 1935).

Lt.-Col. W. C. Shepherd (September 15th, 1935).

Alfred Watkins.

The name of Alfred Watkins will always be associated with the methods of exposure and development which he advocated so strenuously. For his work in connection with this subject he was awarded the progress medal of the Royal Photographic Society in 1910. To him must be given the credit of devising a system of determining the time of exposure based on a measurement of the actinic value of the light, his first article on the subject being published in the BRITISH JOURNAL OF PHOTO-GRAPHY in 1890. He was a keen archæologist and naturalist in addition to other interests. He was in his 81st year. There can be no question that his work has been of great benefit to photographers throughout the world.

Dr. John Hertzberg.

Dr. John Hertzberg, the foremost and most outstanding representative of scientific photography in Scandinavia, died at his home in his 63rd year. His photographic career commenced in a portrait studio, but possessing an essentially scientific mind, he spent some years in studying under such men as Dr. Miethe and Professor Eder. After this he devoted his attention to scientific research, being specially interested in the development of colour photography. To him was entrusted the task of developing the films that were found with the remnants of the Andrée expedition that perished in the Polar regions in 1897. For many years he was editor of the Nordisk Tidskrift for Fotografi."

R. Child Bayley.

R. Child Bayley, who died at the age of 65, made his reputation in connection with photography, though it was in electrical engineering that he commenced his business career. In 1892 he was appointed assistant secretary of the Royal Photographic Society, the official on whom all the secretarial work of the society devolved. The organisation of the International Exhibition of Photography for the Society, at the Crystal Palace, was a fine achievement. After that Mr. Bayley became editor of "Photography," which

improved to a marked degree under his expert guidance; and then, when "Focus" and "The Amateur Photographer" were " Photoamalgamated with graphy" he continued for a time as editor. A little later, he became editor of the "Agricultural Gazette," remaining, how-ever, consulting editor of "The Photographer Amateur Cinematographer." He was the author of a number of photographic books. A fluent speaker and lucid writer, his lectures at photographic society meetings always commanded attention: they were interesting whatever their subject.

Lieven Gevaert.

Lieven Gevaert, who died at The Hague, at the age of 66, was the founder of the firm of Photo Produits Gevaert. Mr. Gevaert was originally in business as a professional photographer in Antwerp, and, taking a keen interest in chemistry and the composition of the materials that he was using, he commenced experimenting in his private house, and first making emulsions for his own printing papers. From that he built up a local reputation and supplied sensitive papers to other photographers. This soon led to the establishment of the original firm of L. Gevaert & Co., with a small capital; but step by step the business progressed, always with Mr. Gevaert as its controlling spirit, until now the staff at Antwerp numbers over 3,000. It is one of the romances of the photographic trade.

Alexander Corbett.

Alexander Corbett, manager for some years of the firm of Ellis & Walery, was well known as an accomplished portrait photographer. ln 1909 opened his own portrait studio and continued working until within ten days of his death, at the age of 66. He was President of the Professional Photographers' Association in 1922-23. and served for many years on the Council, and only a few weeks before his death was assisting in drafting amendments of the International Copyright Convention.

James Brown.

First as sales manager, and later as technical correspondent, James Brown had been a prominent member of the staff of Kodak, Ltd., until his death at the age of 72.

C. F. S. Rothwell.

As managing director of Soho, Ltd., and in connection with his chemical research work for the manufacture of photographic base papers, C. F. S. Rothwell was well known in chemical and photographic circles. He was 64 years of age.

F. T. Usher.

F. T. Usher, the well-known bromoil expert, originally a journalist and editor of the "Herts Advertiser and St. Albans Times," joined the staff of Wellington & Ward in 1922, and remained with Ilford, Ltd., when that firm absorbed Wellington & Ward.

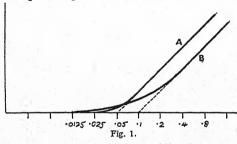
Lt.-Col. W. C. Shepherd.

Lt.-Col. Shepherd entered the service of Ilford, Ltd., as soon as he left school, and for the past thirty years he had been factory manager. He was 60 years of age when he died, having spent 45 years of his life in the service of the Ilford firm.



SENSITOMETRY.

The Speed of Plates.—In a series of articles by the Editor the subject of the determination and methods of indicating the speed of plates was fully considered from the introduction



of the Warnerke sensitometer to the latest system, the Din. It is noteworthy that both of the German systems, the Scheiner and the Din, revert to the principle adopted by the earliest, the Warnerke, in

that they determined the rapidity from the lowest developable density or the shortest exposure that would produce an appreciable image. In this they differed fundamentally from Hurter and Driffield's system, which ignored the extreme shadow detail, and measured the speed from a series of exposures which would produce densities in a regular ratio.

Each of the systems in use at the present time was critically examined and discussed and their weak points demonstrated.

The fallacy in ignoring the lowest densities, or the shortest exposures which would produce a developable image, was illustrated by two "characteristic curves" of plates as tested by the Hurter and Driffield method. In the diagram the curve marked A represents a plate possessing twice the rapidity of a plate represented by the curve B. But, from the manner in which the lower part of the curve—the shadow detail—is very short in A and very long in B, indicates that with identical exposures B would show printable shadow detail where A would fail to record anything at all, though A is nominally

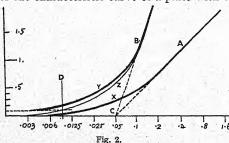
considerably faster than B. This indicates an extreme case but it is unquestionably an important consideration in practice. A second weak point in the Hurter and Driffield system is the light by which the plates are tested—the standard candle. This differs so essentially from daylight in its spectral sensitivity that speeds obtained by exposure to this light are not always reliable guides to exposures necessary in ordinary work. This, of course, varies according to the characteristic qualities of the emulsion, and very considerably where those of different degrees of colour sensitiveness are concerned.

The Scheiner system was dismissed with very slight consideration, since M. Biltz and J. Eggert in an article in "Die Photographische Industrie" stated that the manufacturers generally have given "effective" Scheiner figures which have been estimated rather than based on actual tests. Figures so

obtained can have little real value.

The Din system—the most modern—was considered last. In its inception a weak point in previous systems was eliminated. A light was introduced for making the tests which showed a very close approximation to the spectral value of daylight, and this was a great step forward. A fixed exposure to this light was made through a step wedge, and as the light, the wedge, and the exposure, could all be standardised, the method showed great promise. There was, however, a very weak point. To obtain a speed number from this exposure the plate was given maximum development, and, consequently, a considerable amount of fog was considered permissible and the speed number was read on a fixed scale from the lowest exposure which showed a density of $0 \cdot 1$ above the fog.

This, and the readings for the same plate by the Hurter and Driffield system are illustrated in Fig. 2. A is the straight part of the characteristic curve of a plate with the normal develop-



ment prescribed by Hurter and Driffield. B is the straight part of the curve of the same plate with the maximum development specified for the Din system. These

base line at C where the speed is read on the H. & D. scale. The foot of curve A is represented by X, and the foot of curve

B, allowing for considerable fog through prolonged development, is shown at Y, or if there were no fog, by Z. The speed by the Din method would be read at D and would indicate a rapidity four or five times greater than H. and D. number if both were read on the same scale.

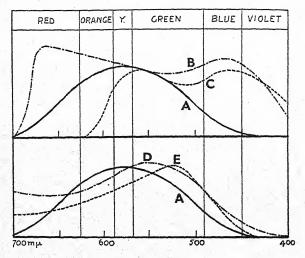
This demonstrates clearly the impossibility of making any comparison between the two systems or using any conversion table for estimating the speed number in one system when plates are tested by the other. In addition to the differences in the spectral value of the lights used and the methods of development specified, one system uses only the extreme foot of the characteristic curve which the other ignores entirely. The H. and D. figures represent density and gradation, while the Din numbers indicate the capacity for rendering weak shadow detail. The suggestion was made that two speed numbers should be given to each plate, one to represent each of these qualities.—Is.J., 1935, May 24, p. 322; May 31, p. 338; June 7, p. 354; June 14, p. 370.

Photographic Possibilities of Polarized Light.—In a communication from the Kodak Research Laboratories F. Tuttle and J. W. McFarlane call attention to the possibilities of utilising polarized light in ordinary photography and cinematography. The fact that screens, incorporating an efficient plane polarizing sheet material, have been made, has simplified investigation along these lines. Numerous possibilities suggest themselves—the control of the light from the sky to give an appearance of "over-corrected" skies without affecting the colour values of objects near the camera, the control of reflections when photographing obliquely through water and on to polished surfaces exhibiting a number of unwanted reflections, and the fact that portraits can be made to display an unnaturally perspiry effect or one of complete lack of any lustre at all. The same screen in a larger form can be used in front of the source of illumination when working in the studio, and the combinations of this screen and that in use over the camera lens present innumerable opportunities for effective experiments. The factor for one Pola-screen over the lens is given as 4, irrespective of its angular position, for any panchromatic or colour-film. When, however, the light sources are also covered by screens, the factor may vary from 10 to 50 depending upon the subject. The optical density of two Pola-screens together and crossed is 3; the transmission is therefore one-tenth of one per cent.—I.S.M.P.E. (America), 1935, July, pp. 69-78.

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Yellow-Green or Blue-Green Filters .-- In the "Camera" -Lucerne-Dr. H. M. Kellner has discussed very fully the subject of the correct translation of colours into monochrome with panchromatic plates. He has examined the different types of filter in order to determine which would give the truest rendering of colours in comparison with their visual brightness.

Dr. Kellner considers that the question has become complicated as there are now panchromatic emulsions with very high red sensitivity, while others have comparatively low sensitiveness to red. Originally blue-green filters were supplied for panchromatic emulsions, now there are yellow-green filters available, and the object of his examination of the subject was determining which of these two would be the best for general use.



The suitability of a particular type of filter can be easily determined by examining its spectral transparency and comparing this with the sensitivity of the eye and the emulsions with which the filter is to be used. Dr. Kellner's conclusions tend to show, however, that the filter most suitable for the panchromatic emulsion will also be preferable for the orthochromatic.

In the diagrams, A represents the sensitivity of the eye. B the spectral sensitiveness of the pan chromatic emulsion and C the orthochromatic. D shows the spectral transparency of the yellow-green filter and E the blue-green. The divergence between the two types of filter is greatest in the green, yellow-green, yellow and orange-yellow regions. The sensitiveness of the eye is greatest in this region and, consequently, the filter which has the greatest transparency to the colours which are brightest to the eye is preferable for general use. The emulsion sensitiveness should not be depressed in the region where the sensitivity of the eye is greatest.

After discussing the subject very thoroughly, Dr. Kellner considers that the yellow-green filter is preferable for general use for all emulsions, orthochromatic and panchromatic as its maximum transmission corresponds very closely with the

sensitiveness of the eye.—B.J., 1934, Nov. 30, p. 711.

Influence of Water on the Sensitiveness of Photographic Emulsions.—Mons. André Charriou and Mlle. Suzanne Valette have given the conclusions formed from their investigation of this subject in the "Revue Française de Photographie." Their experiments have been conducted on supersensitive ordinary emulsions exposed under blue screens, orthochromatic exposed under blue and yellow screens, and panchromatic exposed under yellow and red. In each case two pieces were cut from the same plate. One piece was immersed in water and then immediately exposed in a sensitometer and the other piece exposed dry. The two pieces were then developed together for the same time, so that the results could be accurately compared. In each case the experiment was repeated several times.

The loss of sensitiveness for all the plates which were exposed under a blue screen was approximately 60 per cent. after immersion for five minutes, and with 30 minutes soaking

the decrease in sensitiveness was 75 per cent.

The loss of sensitiveness is less pronounced in the case of orthochromatic and panchromatic emulsions exposed under a yellow screen, and still less with panchromatic emulsions exposed under a red screen. With the yellow screen the decrease in sensitiveness was 65 per cent. after soaking for 30 minutes, and with the red screen the panchromatic lost 35 per cent. in 30 minutes.

A practical outcome of this desensitising action of water is that highly sensitive emulsions become partially desensitised if development is prolonged beyond three or four minutes and considerably more light—red light, necessarily—may be used for inspection without risk of fog or veiling.—"Revue Française de Photographie," August 15, 1935, p. 251,

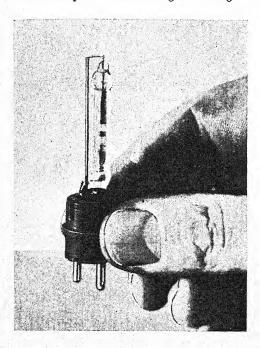
Grain Size in Photographic Emulsions.—Olaf Bloch gives an account of the considerations affecting the size of grain and the problem of its measurement. The sensitive material of a photographic emulsion consists of silver bromide crystals held in suspension in gelatine, and these may vary very greatly in size, shape and distribution. Generally, the proportion of large crystals increases with sensitivity, and is by no means uniform in any one emulsion. Grains may vary in size from 0.1μ (= 1/10,000 mm.) in the finest grained lantern emulsions to 1.2 in fast portrait emulsions, and may take any form from flattened plates to a more or less spherical shape. Recent progress in emulsion manufacture has improved the uniformity of distribution of grain, reduced the crystal size and almost eliminated clumping, or aggregation of individual crystals into single clusters which, after exposure, develop as single units and so coarsen the grain. Any two grains which touch will develop as a single grain, even though one only has been exposed to light; and such contact may be brought about by the increase in size of the grains upon development. Special "fine-grain" developers usually function by virtue of their slow action, resulting in a contrast (gamma) lower than normal. If development with such a developer is prolonged to give a normal gamma there will be found to be little difference in grain size.

Graininess is largely a physiological effect, and it is not possible to set up an absolute standard of measurement. It might be defined as the distance at which the image of the silver deposit no longer appears uniform at constant magnification, or the magnification at which it no longer appears uniform viewed from a constant distance. One method of measurement is to make a micro-photometer record of the density of an evenly exposed and developed plate. The record is a wavy line the deviations of which are a measure of graini-Since the deviations vary with the slit width of the instrument, this must be standardised. Another method is to measure the density of the negative by means of both parallel and diffused light. Plotted against one another these measurements give figures which approximate to the relative graininess over part of the curve; but this appears to be due to a coincidence rather than to any underlying principle.

The various methods, while giving only comparative results, have been of considerable assistance in improving photographic material in respect of grain.—B. J., 1935, March 29, pp. 195-6.

LIGHTING.

A High-power Concentrated Illuminant.—Mr. Bol, Physicist at the Philips' Research Laboratories at Eindhoven, has developed a remarkable gas discharge lamp. The problem



of bulk, which has hitherto restricted the development of mercury vapour lamp. has been solved as a result of experiments with air and water cooling. and the sealing in of heavy tungsten wires into quartz tubes, and mercurv lamps have now been produced smaller dimensions for the same light flux than any other known type of lamp. The new lamps comprise quartz tubes having a diameter of

only 5/64 in. internal, and about 1 in. external. The electrodes are of mercury with a point of tungsten wire prepared with an alkaline earth oxide just protruding from the mercury. The lamps are run at a very high voltage amounting, per inch length of discharge, to as much as 1,250 to 1,750, and in some cases 2,100 volts. At this last voltage the internal pressure in the tube is 3,500 lbs. per sq. in. A lamp of this kind, only 13/16 in. long, taking a current of 1.35 amp., consumes 1,450 watts and emits a luminous flux of 80,000 lumens. Its surface brightness attains the remarkable value of 250,000 C.P. per square inch—one-fourth of the surface brightness of the sun as seen from the earth. For still higher power, a

proportionately longer tube is employed, but even a lamp of 9 k.w., emitting 500,000 lumens, is only 6 ins. long, and 1 in. thick, i.e., no larger than an ordinary lead pencil. It should be mentioned that the light is considerably whiter than mercury light of the kind employed hitherto, and, examined spectroscopically, is found closely to resemble daylight, the vellow-green being slightly in excess.

The accompanying illustration shows a 600-watt lamp from which the outer glass cover has been removed. The intrinsic brightness of this lamp is some 50 per cent. higher than that of the ordinary carbon arc.—B.J., 1935, June 21,

p. 387.

Increasing the Lighting in Enlargers.—The problem of making large scale enlargements, in a minimum of time, from over dense miniature negatives has been met by S. W. Bowler by overrunning a lamp under conditions controlled to conserve its He points out that, particularly with precision enlargers having a carefully designed optical system of which the lamp is an integral part, it is not practicable merely to change the lamp for one of higher power. By overrunning the standard lamp, however, greatly increased illumination and actinic power is obtained without disturbing the optical efficiency. It is, however, necessary, in order to prolong the life of the lamp, which is greatly shortened by overrunning, to bring it up slowly to full brilliance and dim it again immediately after the exposure. For this purpose a sliding resistance is used, in a circuit as shown in the diagram, and lamps are overrun to the extent of about 30 per cent., i.e. a 150 or 155 volt lamp is used on a 200 volt circuit. The resulting speeding up in exposure amounts to some 12 times, whilst the life of the lamp, the cost of which varies from 3s. to 5s. per lamp, may still be as much as 20 to 30 hours. As it is not usually possible to obtain these low voltage lamps from stock, it is wiser to place an order for two or three at a time. The important point to remember is always to switch on the lamp with all resistance in circuit, and bring it up only gradually to full brightness.

The double-pole fuses shown in the diagram are necessary because there is liable to be a heavy surge of current when the lamp finally burns out: the fuses will prevent a possible black out of the general lighting installation of the dark-room.

The double-pole switch, double-pole fuse and resistance can be mounted on to a block and the whole screwed in a convenient position on the enlarging bench or on to the wall near the enlarger it is to control,

For those who may have already some form of sliding resistance, but which is not of suitable resistance value, the following table is given to enable them to rewind it. Enamelled wire is suggested, as this is the simplest form to bare of covering at the required place.

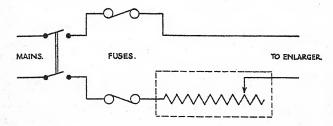


TABLE.

Enamelled "Eureka" or "Constantan" Resistance Wires.

| | | ** 1 | 01 | 0.4.0 |
|-------|----------|---------|----------|--------------------|
| | Turns | Yards | Ohms | Safe Current |
| Gauge | per inch | per lb. | per foot | Carrying Capacity* |
| 20 | 27 | 85 | •230 | 3.0 amps. |
| 22 | 34 | 140 | -366 | 2.2 amps. |
| 24 | 43 | 227 | .585 | 1.5 amps. |
| 26 | 52 | 340 | •930 | 1.0 amps. |
| 28 | 62 | 503 | 1 · 400 | 0.76 amps. |
| 30 | 74 | 716 | 1.870 | 0.59 amps. |
| | | | | |

* for a rise in temperature of 100° C. on load.

[Courtesy, Bromley-Langton.

The length of wire required to rewind the ordinary cylindrical former is easily calculated from the following formula:

$$1 \times \text{tpi} \times \text{d} \times \frac{22}{7}$$

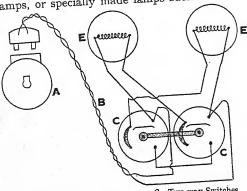
where l = effective resistance length of former, in inches. tpi = number of turns per inch of wire selected. (See table).

d = external diameter of the former, in inches.

The value of the resistance R required can be calculated approximately from the formula $R = \frac{V^2}{4 \, \text{NV}}$ where V is the

mains voltage and W the wattage as marked on the lamp.—B.J., 1935, July 5, p. 422.

Using Over-Run Lamps.—The use of over-run half-watt lamps, or specially made lamps such as the "Nitraphot," or



Two-way Switches. Switch Plug. B Flex to two-way Switches. using the full strength of current, is desirable.

flood"; is E now becoming a mon practice in both studio and in the home.

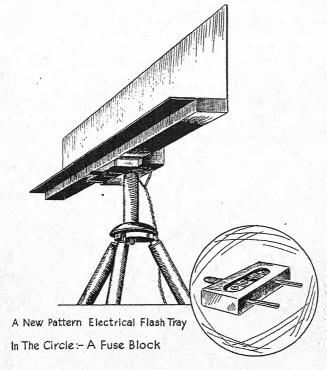
In the using of these some lamps, method allowing themto warm up on a low voltbefore age,

In some cases a variable resistance has been recommended, but the following simple series-parallel system of switching, giving much better results, and needing only standard fittings will be found more convenient and effective. use of this switching system the subject can be arranged, etc., with the lamps on half-voltage giving a light equal to lamps used on normal voltage, the lamps warming up during this arrangement of subject. When ready, the full voltage can be switched on to observe the lighting effects, and then to take the photograph. It is only necessary to use the full voltage for a matter of seconds; thus the sitter is not made uncomfortable by the heat and intense light, and the life of the lamps is greatly prolonged.

The wiring diagram is self-explanatory; in use with both knobs "down," the lamps are in series, and give normal light; with both knobs "up," the lamps are in parallel, as shown in diagram, taking the full voltage from the mains and giving intense light. For the usual 230-volt supply, 150-volt lamps can be used, or if not easily obtainable 120-volt; of wattage to suit; or "Photoflood" or "Nitraphot" lamps may be substituted. Any number of lamps can be used.

This system is far more convenient and quicker than using a variable resistance, and much more satisfactory than using the lamps always on full voltage.—F. Farnworth, B.J., 1935, July 19, p. 456.

An Improved Electrical Flash Tray.—The factory photographer frequently finds himself confronted with the prospect of having to obtain a photograph by flash light.



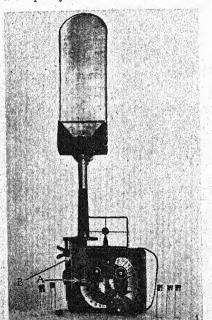
This apparatus is electrical and not mechanical, consequently

operating takes place as remotely as desired.

A strip of brass 1/32-in, thick \times 12 in, long, was bent in the manner shown. At the bottom of the tray in the centre of its length is a small hole which allows access of the powder to the fuse or igniting element when in commission. The fuse consists of a hard fibrous moulding 2 in. $\times \frac{3}{4}$ -in. $\times \frac{1}{4}$ -in, slotted out on one side to take contacts. These contacts are small pieces of brass fitted in the recess with a gap of $\frac{1}{8}$ -in, between. Across this gap the fuse wire is fastened by two small screws and washers. Connections are

brought out through the side of the fuse block in the form of plugs. The fuse-block is supported underneath the tray by two clips which guide the block so that it may be pushed into contact with socket at the rear of the tray. These sockets have been fitted into an ebonite block at the rear of the tray and by means of brass strips are allowed to terminate on the outer edge of the ebonite block in the form of terminals. Firing is made possible by means of connecting the lamp to a battery containing two 4 volt dry batteries arranged in series by means of flex of any desired length. When the battery is switched on, the flow of current causes the fuse wire to glow, igniting the powder.—E. Foxton, B.J., 1935, Aug. 2, p. 485.

A Simple Synchronised Flash Lamp.—Some time ago from force of circumstances, J. H. Cleet designed and used a simple synchronised flashlamp. It might be said that the

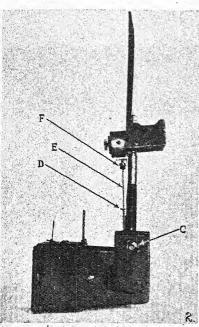


type of camera built on the Shew principle lends itself particularly to the use of the device, but there seems to be no reason why the principle should not be adapted to any existing type of camera. It is simple, and direct acting, as will be seen from the following ing brief description:

Fig. 1 is a front view of the lamp fitted to the camera. At the top is the reflector shaped to the flame. This is detachable and is simply clipped on. The powder pan, as will be seen, has been built up to protect the powder from wind. The rod coming from the lamp

release rests on the shutter release at A, and B is a locating

piece to ensure that the lamp fitting drops into the correct position. At the sides are six tiny phials, each of which, when



not quite half-full, carries the correct amount of powder for a five-yard shot. This enables the operator to drop the correct amount of powder into place in dim light or even in dark-The amount ness. of powder may seem small, but the author advocates the minimum charge of powder and the maximum aperture, especially for Press work. a matter of fact, he is of the opinion that flash-powder has been brought into disrepute principally through operators stopping down and using unnecessary quantities.

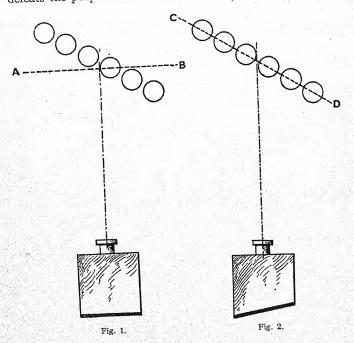
Fig. 2 is a side view of the fitting on

the camera. C shows the fly-nut which tightens up what is simply a clip on the camera. D is the release operating lamp and shutter simultaneously. E is the connecting rod from lamp to shutter, whilst F shows two compensating nuts by means of which correct synchronisation is obtained. The removal of the upper nut allows the top part of the lamp to be removed so as to adjust the flint pressure spring.—J. H. Cleet, B.J., 1935, Sept. 20, page 601.

APPARATUS.

Side Swing.—The increasing use of pocket types of cameras tends to diminish appreciation of the various "movements" of the field variety. In many quarters the virtues of such movements are unknown. Depth of focus in the miniature camera, except when fitted with an ultra-rapid lens, is such that it becomes necessary neither to contort the camera nor to use small stops, with consequent long exposures, when detail at various distances has to be rendered with sharpness.

But there are many occasions when such depth of focus defeats the purpose of the picture.

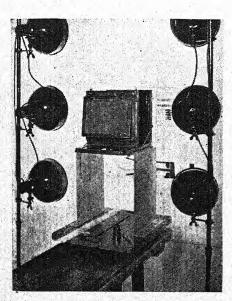


In the kinds of subjects under consideration, the disadvantages of using a small stop upon receding detail may be three: the exposure may be inconveniently prolonged, movement of the subject may occur in consequence of that prolongation, and last but not least the "standing-out" effect

of a sharp subject against a softly defined background will be sadly diminished. There is a very numerous class of subjects upon which that desirable standing-out quality has to be thrust by every possible effort on the part of the photographer, by the application of every means at his disposal. One of the most useful of those means happens to be the side-swing, but on very few cameras is it placed at the photographer's disposal.

Fig. 1 is a group of objects arranged obliquely to the camera. The plane of greatest sharpness is shown at A.B., when no side swing is available; a small aperture is necessary for obtaining a sharp image. Fig. 2 shows the same group and the use of the side-swing. The plane of greatest sharpness is now C.D. A large stop may be used and the objects well defined with the background softly diffused.—David Charles, B.J., 1935, Aug. 23, p. 531.

A Copying Installation.—S. J. Brown describes a copying installation of very simple construction which nevertheless fulfils the three essential requirements; absolute rigidity, easy



and rapid movement of the camera at right angles to the copy-board, and even adequate illumination. The bench which carries the sliding platform consists of two oak planks, 6 ft. × 9 ins. × 1½ ins. thick, bolted side by side on to stout crosspieces resting on cast-iron legs.

Wooden legs, of course, would be perfectly satisfactory, but they should be secured throughout with bolts and nuts. The bench will be used as a seat during focussing operations, and ordinary

wood screws will soon tend to work loose.

For rigidity, economy and convenience of working, the bench is kept low, and the lens raised to the ideal height of 4 ft. 6 ins. by means of a platform cheaply and easily made by bending a piece of sheet steel one-eighth in. thick to the shape shown, and screwing it down to the sliding base. necessary friction between camera baseboard and metal platform is provided by a sheet of rubber, the tripod screw, which passes through a hole in the platform, being screwed up finger tight. Reference numbers are painted along the bench, and the exposure details, corresponding to each setting as read by the metal pointer on the base, are recorded and tabulated.

The illumination is provided by six white enamelled reflectors fitted with 500-watt pearl lamps. Each can be switched on independently, and completely even illumination

is secured.—B.J., 1935, March 15, pp. 163-4.

A Mobile Tripod for Difficult Subjects.-To overcome the difficulties of photographing and copying certain classes of subjects, W. Eagling has constructed a cheaply-built,

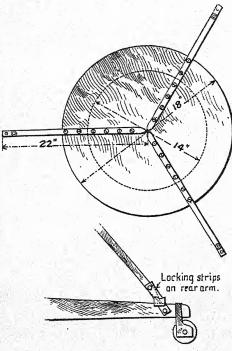
adaptable and timesaving apparatus.

The arms of the base are constructed of 2 x 1 oak, with plywood discs to stay them ; rubber bearings for tripod tips are the standard & diameter door stops, recessed and screwed into the arms, the rubbertray-castors tvred are also a standard article obtainable at any woodwork store.

The adjustable head might be one of the ball-and-socket type, but, as constructed, utilised the adjustable bracket an old motor

windscreen, which has a good tilting movement, with positive

locking by wing-nut. The camera-board is 3 ply bolted to



the bracket, and in addition to the one hole fixing has a detachable disc of ply which is fitted with brass brackets to fit the turntable of a ½-plate field camera, should the occasion demand the use of one.

Working with the light from a fixed source. with the subject mounted on a small table or stool, it is quite a simple matter travel the camera round the subject to discover the best position.

To obviate the tendency, when using a

heavy camera, for the tripod to tilt forward, the back arm is fitted with a checking-device consisting of a pair of thin brass strips $\frac{1}{2}$ in. wide, 3 ins. long, which are screwed one each side of the arm and drilled at their free ends to take a short length of $\frac{1}{4}$ in. diameter brass rod which passes through the tripodleg, holding it firmly to the arm.—B.J., 1935, April 19, p. 252.

Coupling a Range-Finder to a Press Camera.—The miniature camera has demonstrated the advantage of focussing by means of a coupled range finder so completely that the case needs no restatement. There are, of course, moments when a focussing screen has its points, but the coupled range-finder can give a precision and speed of working unobtainable by any other method.

The camera dealt with in this article is a 10×15 cm. Nettel Deckrullo, fitted with a $7\frac{1}{2}$ ins. f/3.5 Cooke lens. It is used for work which necessitates full aperture, except with very favourable conditions. Under these circumstances it will be

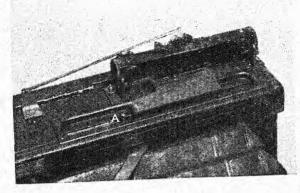
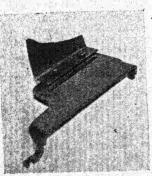


Fig. 1.

appreciated that when working by scale, there is no saving margin of depth of focus at five yards, and that guessing anything less is extremely hazardous.



With the help of a Leitz range finder it was decided to attempt to couple the focussing. The focussing is by lazy tongs struts controlled by a milled knob at the wind side of the camera. Turning the milled knob causes a carrier, which picks up the free end of the top lazy tongs strut, to move along the guide on the top of the camera body. carrier has on it a pin with a flat head (A, fig. 1), the purpose of which is to release the struts for It was decided to use folding. this pin as the starting-point

of the connection of the focussing movement to the range finder, and a travelling member (fig. 2) was constructed, the two forward ends of which fit into the guide, one of them extending along underneath the guide to connect firmly with the pin. The back of the travelling member rests on a flat strip on the top of the camera, which can be seen in fig. 3.

The range finder is supported on the camera as can be seen in figs. 1 and 3, with a rest at either end and straps to hold it down, so leaving the underneath clear for the movement of the travelling member. The range finder was fixed so that the eyepiece is just slightly lower, but in the same line as the normal view-finder back sight.

Now comes the critical part of the whole business. A pin is fixed in the wheel of the range finder, and a cam made to complete the coupling. A series of measurements was made between the travelling member and the pin vertically at the

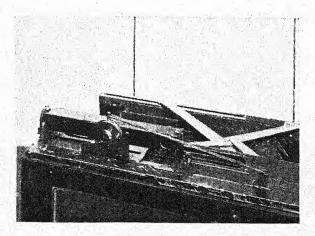


Fig. 3.

usual scale distances, and from these the approximate shape of the cam found. The cam was cut with a margin above the calculated curve, and on this the errors marked, firstly at the measurement points, and then intermediately. In this way the final contour of the cam was arrived at.

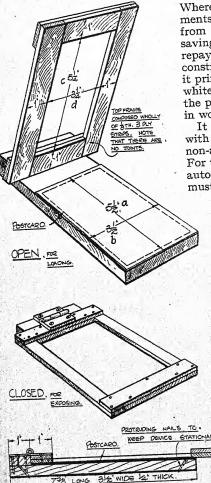
As can be seen, the pin on the wheel is kept in contact with the cam by the pull of an elastic band anchored to the top of the camera. A number of light springs were tried, but none could be found which gave the same light even pull as the rubber band.—Eric Greenwood, B. J., 1935, Feb. 8, page 85.

Projection Printing Device.—The postcard printing device, as shown in the illustrations, can be easily constructed

at a very trifling cost. Where postcard enlargements have to be made from small negatives the saving in time will soon repay the time spent in constructing it; as shown it prints with a one-eighth white margin all round the print. It is very rapid in working.

It is intended for use with semi-automatic or non-automatic enlargers. For those that are entirely automatic the baseboard must be removed and this

device so fixed that the surface a is exactly in the plane occupied by the baseboard of the For the enlarger. semi-automatic or focussing type the device is simply clamped on the baseboard and the image focussed in the usual manner. Although the device as shown is intended for postcard printing, it would be found equally convenient for larger sizes. A simple addition would be the provision of masks for holding paper or cards of smaller sizes than the maxi-



for holding procards of sizes than the mum.—Wm. J. Stuckes in B.J., 1935, Feb. 1, p. 79.

A Useful Camera Stand.—It is not until we have used an adjustable stand for a studio camera that we realise how limited in usefulness the ordinary tripod can be. The stand

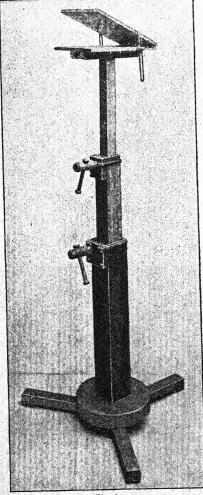


Fig. 1.

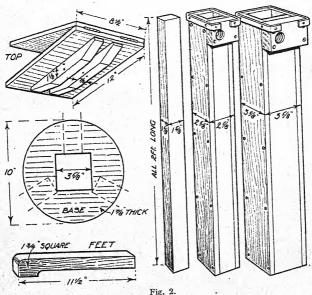
described and illustrated will be found most convenient in practice. It is firm and portable and free from all the objections that apply to a tripod. The camera is always level, though it can be tilted up to a right angle when needed, it can be raised from a ground to lens level of 3 ft. up to 6 ft. 3 ins., and it is not easily knocked over. cost worked out quite low.

As shown, it consists of three uprights sliding one within the other. To the top of the centre one is fixed a platform with an upper platform hinged to it. The upper one holds the camera, which can thus be tilted to any angle up to 90 deg. A heavy base is fixed to the largest section at the bottom with widely splaying feet beneath. Practically any strong hardwood is suitable. Dimensions are given in fig. 2.

The smallest or innermost section finishes Is ins. square and is a solid piece of wood. The other two are built

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up, and are simply in the form of a long, narrow box with the sides glued and screwed together. After assembling they are planed to make an easy fit one within the other. enable them to be locked in any desired position, wooden screws are fixed to the two larger sections as in fig. 2. Actually,



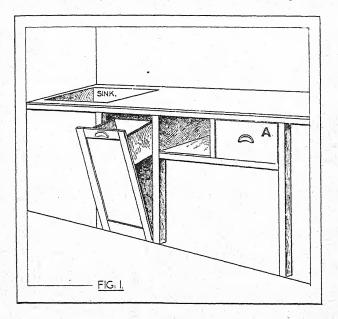
Dimensions and constructional details of the stand.

they are a small wooden bench screw cut in two. To prevent the pressure from splitting the wood, a strip of brass is screwed

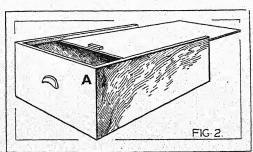
around the tops as in fig. 2.

The base is $1\frac{7}{8}$ ins. thick. It should be as heavy as possible, though its shape is not important. A square hole is cut in the middle to take the largest section, which is fixed with four screws. Three feet are cut out to the size in fig. 2 and screwed to the underside.—C. H. Hayward—B. J., 1935, Oct. 18, page 663.

Dark Room Aids .- The two devices illustrated in the sketches are simple in design and construction and efficient in operation. The question of waste material in a small darkroom is frequently more of a nuisance than it ought to be.



The waste receptacle illustrated is merely a square box screwed to the back of the top of a swinging panel in the bench front, hinged or pivoted at the bottom. It has to be pulled open to throw in whatever waste is to be disposed of, and then, due to the weight of the box being at the top of the panel and its consequent top-heaviness, it drops back into position of its



The second' illustration concerns the drawer marked "A" in the first sketch, which is used for holding printing and enlarging

papers.

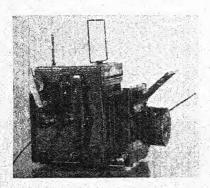
own accord.

The drawer shown in Fig. 2 goes right to the back of the bench, so that when the drawer is pushed home, the sliding lid is driven forward. Next time the drawer is pulled out, it will be found to be covered completely; it is a perfect check and it usually makes one think twice before pushing back the sliding lid in white light.

The sliding lid solves the problem simply, and can be fitted to almost any drawer in a short time with the minimum of tools. If a new drawer is being considered, then the lid can be fitted as an integral part of it.—Stanley W. Bowler, B.I.,

1935, Oct. 18, page 662.

Slow Speeds on a Reflex .- A. Fraser describes an airgovernor attachment to a reflex giving shutter speeds down to second or lower. The illustration shows it in position on



the knob of the separate slit adjustment which is provided, in this camera, above the shutter rewind, and which revolves at 71 times the speed of the shutter rewind knob. A wood or cork adapter, slotted to take the cardboard governor blade, is made to push on to this knob. The shutter is set to full . slit aperture, giving normally 1 second exposure, and the size of the governor blade then

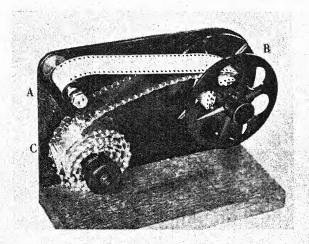
regulates the shutter speed. For speeds of 1/10, 1/5 and } second, the size of the governor blades were respectively $3\frac{3}{16} \times 1\frac{1}{16}$ ins., $2\frac{9}{16} \times 4\frac{1}{8}$ ins., and $3\frac{3}{16} \times 5\frac{5}{16}$ ins. The only limit to the lengthening of the exposure is the unwieldiness of the governor blade, and the risk of its fouling. Advantages of this system are vibrationless working, and even exposure throughout the plate.—B.J., 1935, March 8, p. 150.

Winding Film for Processing.—To the professional photographer who enters the realm of miniature camera work, there are a number of apparently simple operations to perform during processing film that are not so easy when they are tackled in total darkness or that state of illuminated blackness

that is permissible for rapid panchromatic material, as they would appear from the usual descriptions.

To handle film taken from a Leica or Contax camera, it is essential not to touch the emulsion, and keep it free from marks or small abrasions unless hours are to be spent in spotting out each enlargement. To do this satisfactorily in small quantities, a tank of the Correx type will necessitate a winding spool, which presents a certain amount of initial difficulty in loading unless some simple device is at hand to make the operation automatic.

The accompanying illustration shows a wooden stand on which has been mounted a spring clip A, to hold the camera



spool, a peg B, on which to rotate the winding spool, and a simple duplicate winder C, on which the apron may be wound before starting operations.

In use, the end of the apron (previously wound on the holder C) is inserted in the clip provided on the winding-spool B. The light is turned out and the camera-spool is clipped in a rotatable manner at A. The end of the film is now brought across and inserted in the clip of the winder B, together with the end of the apron, and on rotating the latter, the film and apron are wound on together.—Bernard Alfieri, jun.—B.J., 1935, Oct. 11, page 644.

DEVELOPMENT.

New Formula for "Compensation Development."—Dr. Friedrich Bürki writes from the Basle University to "The Camera," Lucerne, giving details of a pyro developer for cases of doubtful exposure. He complains that pyro as a developing agent in such "compensated" developers has been overlooked, though it has been known for years to be very satisfactory for this purpose. References have been made to its use, but no definite formula given.

It has been found that pyro and caustic soda will work admirably in a "compensated" developer, providing that the proportion of soda is correctly balanced and adjusted. Metabisulphite is used as a preservative and as this makes the solution acid, it must be balanced by the correct amount of extra

caustic soda.

With the following considerations the formula below is

possible:

 Pyro ...
 ...
 29 grs.
 3 gms.

 Potassium metabisulphite, 10% solution Caustic soda, 10% solution ...
 5 drs.
 30 c.c.s.

 Water to ...
 3 drs. 20 min.
 20 c.c.s.

 Water to ...
 20 ozs.
 1,000 c.c.s.

Time of development will be found to be 5 to 6 minutes at 65° F. The image is of a greenish-brown appearance, and though it has a "soft" look is of good printing value.—B.J., 1934, Dec. 7, page 727.

Continuous Development by the Tank Method.—In a communication. No. 539 from the Kodak Research Laboratories. C. E. Ives describes a method devised to obtain some comparison in results of machine type continuous development in the rack and tank process. The rack is constructed in such a way that the film is moved continuously over rollers during processing. The film traces a helical path passing over rollers carried upon an upper and lower shaft, is then led back along the bottom of the rack where a closed loop is formed by splicing the ends of the film together. The film is propelled by the rotation of the upper shaft and rollers, which, in turn, are driven by a motor and reduction gear. The lower shaft is allowed a slight parallel displacement in the vertical direction in order to compensate for the expansion of the film when it is wet. The particular advantage of this roller-rack is that it is self contained with its own individual motor drive and thus may be used in any ordinary tank which will accommodate

The motor drive consists of a 1/20th H.P. motor of the repulsion-induction type running at 1,725 r.p.m., driving a 10:1 reduction gearing through a V-belt, the whole being mounted inside a stainless steel casing to protect the apparatus from processing solutions and the film from oil splashes. The drive from the reduction gear to the upper shaft is by a roller chain, also of stainless steel. The same material is used for the rest of the rack construction. In view of the difficultiesof lubrication, it has recently been found that synthetic resin compositions for bushings give good service. Further references to other works of the author and of J. I. Crabtree are given on similar subjects in reference to rack-and-tank work.—I.S.M.P.E. (America), 1935, March, pp. 261-274.

Intensification by the Physical Method.—Intensification by deposition of silver direct is as old as physical development. It was brought to the attention of the public, so far as dry emulsions are concerned, by Wellington, who, in his revised formula, followed closely the work of Sterry.

Silver intensification has one advantage which is only shared in part by the best of the other methods, that of perfect safety. The process is so gradual that any desired degree of intensification can be arrived at with no danger

of over-stepping the wished-for end-point.

It is proportional, so that a finished product is secured with, at least, all the good qualities in the way of contrast that

might have been in the original negative.

In the author's original paper on physical development attention was called to the use of the developing solutions for intensification. Subsequent experiments have shown that by slightly increasing the amount of silver in the stock solution, but in no other way changing the method outlined at that time, more rapid intensification can be secured. The additional silver may be introduced into the stock solution after diluting for use.

The procedure is as follows:-

SILVER STOCK SOLUTION.

80 gms. (2-2/3 ozs.) Sod. thiosulphate, cryst. Sod. sulphite, anhyd. 30 gms. (1 oz.) 8 gms. (120 grs.) Silver nitrate crystals Water, to make 500 c.c.s. (16 ozs.)

Dissolve the sulphite in 150 c.c.s. (5 ozs.) of water (preferably distilled); dissolve the silver nitrate separately in 50 c.c.s. (2 ozs.) water. Add the silver solution to the sulphite solution and stir until the white curdy precipitate dissolves, which it will do quickly. Then dilute the mixture to 450 c.c.s. (14 ozs.) with water, now add the thiosulphate (hypo) crystals and stir until they are dissolved. The volume after the solution of the thiosulphate will be found to have increased to the desired 500 c.c.s. (16 ozs.).

It will be observed that this is the standard silver stock solution which is used for physical development according to the methods already given. To use this solution for negative intensification, proceed as follows:

To make 150 c.c.s. (5 ozs.) of diluted solution, take 0.5 gm. (8 grs.) silver nitrate and dissolve it in 120 c.c.s. (4 ozs.) water. Pour this in a steady slow stream into one ounce of the silver stock solution already made up. In this solution, dissolve 0.7 gm. (10 grs.) of a developer of the "metol" type, such as metol, rhodol, elon, photol, etc., after which, and just before use, add from 10 to 12 c.c.s. (slightly less than \frac{1}{2} oz.) of dilute ammonia, prepared by diluting strong ammonia of specific gravity .90 to .92, in the proportion of one part to 9 parts The exact amount of ammonia is not critical, as its function is to start the reduction and precipitation of the silver. The latter occurs within a minute or two after the addition of the 10 per cent. ammonia solution to the intensifying solution. The more ammonia used, the faster the precipitation takes place. A moderate rate of precipitation extending over about one hour is desirable.

While the negative to be treated may be either wet or dry when introduced, preferably it should be dry, as for some reason a wet negative tends to collect silver on the surface. The negative must have been thoroughly washed. If there is any doubt of it at this point, it should first be immersed in an oxidising bath to destroy any hyposulphite compounds remaining in the emulsion.

| | Potas. ferricyanide | - | | 0.5 | gm. | 8 | grs. |
|------|---------------------|---|-----|--------------------------|--------|----|------|
| | Potas. bromide | | | 0.5 | gm. | 8 | grs. |
| | Water | | 15 | 250 | c.c.s. | 8 | ozs. |
| or: | | | | | - | | |
| La C | Potas, bichromate | | 13. | 0.5 | gm. | 8 | grs. |
| | Potas, bromide | | | Secretary and the second | | | grs. |
| | Acetic acid | | | Language 1 | 10 dro | ps | |
| 1.15 | Water | | | 250 | c.c.s. | 8 | ozs. |

The negative should remain in the solution for about one minute.—Dr. Allan F. Odell; "The Camera," Philadelphia.—B.J., 1934, Dec. 14, p. 741.

PRINTING.

Brown-Black Tones on Bromide Papers.—A method was published some years ago for obtaining warm black tones in bromide prints by bleaching in an acidified solution of potassium bichromate and then re-developing with any developer suitable for chloro-bromide.

In the "Revue Française de Photographie" it is pointed out that the increase in warmth of tone is very slight, and it is claimed that the method described by the writer produces a good warm black colour.

The print is bleached in:-

| Potassium permanganate | | 1 | gm. | $4\frac{1}{2}$ | gr. |
|------------------------|----|-------|------|----------------|---------|
| Hydrochloric acid | ٠. | .25 | c.c. | 120 | minims. |
| Water, to make | | 1,000 | c.c. | 10 | oz. |

This bath deteriorates rapidly and must be prepared at the moment of using.

The print should be washed for a few minutes in several changes of water and re-developed in a solution prepared by taking equal parts of the following:—

| A. | Pyrocatechin | 1.5 gm. | 6½ gr. |
|----|---------------------|----------------|--------|
| | Water, to make | 1,000 c.c. | 10 oz. |
| | Potassium carbonate | 12 gm. | 52 gr. |
| | Water, to make | 1,000 c.c. | 10 oz. |

Solution A will only keep for two or three days, B will keep indefinitely.

Development should be stopped when the image is sufficiently strong. If the action is taken to finality the print is slightly intensified. After development the print should be fixed and washed as usual. If appreciable intensification is desired, the bleaching bath should be:—

| Potassium bichromate 10% | | |
|--------------------------|----------|--------|
| solution | 20 c.c. | 2 oz. |
| Hydrochloric acid, 10% | | |
| solution | 40 c.c. | 4 oz. |
| Water, to make | 100 c.c. | 10 oz. |

The print should be washed until the yellow stain of the bichromate is discharged and then developed.

The warm tones are due to employing pyrocatechin without sulphite, and in a very weak solution.—H. Cuisinier, "Revue Française de Photographie," 1935, Jan. 1, p. 31.

Fixing and Stop Baths for Papers .- Dr. E. Weyde, of the Agfa Research Laboratories, investigated fixation conditions and the composition of stop baths in relation to the permanence of the print. He found that paper is very absorptive of sodium thiosulphate, and that small alterations to the composition of the fixing bath may considerably influence the resulting print, especially if dried by heat. The speed of fixation varies with different papers, but for almost all types except green developing papers such as Agfa Verdex, fixation is complete in 1-2 minutes in fresh 20 per cent. hypo acidified with 2 per cent. potassium metabisulphite, fixation being of course much accelerated by keeping the prints moving. Speed of fixation diminishes with decreasing content of hypo and with increasing concentration of silver salts and acid (from the stop bath) and with decreasing temperature; the retarding effect of the silver salts is greater, the weaker and more acid the bath. In general, 10 minutes is sufficient even for a well-used bath. In a fresh bath, five minutes should not be exceeded, because longer immersion not only tends to dissolve the image, but also renders the thiosulphate more difficult to wash away. The effect of carrying over of solutions by transference of prints from one bath to another is to reduce the concentration of thiosulphate to the extent of 40 per cent. to 50 per cent. when 500 9 × 12 cm. thin paper prints are fixed in one litre of fixing solution, or 50 per cent. to 60 per cent. in the case of card. At the same time the bath is enriched in silver salts to an amount dependent upon the silver content of the paper used but at most 3-4 gm. in the case of papers with 2 gm. per sq. metre, since a considerable proportion is carried over into the water. In practice, 300 9 × 12 prints is the maximum number that should be fixed in one litre of 20 per cent. fixing solution. A concentration of more than 2-3 gm. silver per litre of the fixing bath leads to yellow discolouration of the whites in subsequent sulphide toning, through failure to wash out the silver salts. If no intermediate bath of any kind is used, any alkaline developing solution carried over readily reduces the thiosulphate solution to silver, causing stains. An intermediate water bath does not completely eliminate this risk because the acidity of the fixing bath is still rapidly diminished, and gradually changed to an alkaline reaction. It is therefore convenient to use an acid stop-bath, especially with gaslight papers. This bath should not be too acid, as this leads to excessive acidity of the fixing bath, with resulting difficulty of subsequent washing and a tendency to sulphiding of the image, particularly with fine-grain emulsions which tend to give reddish half-tones. The degradation resulting from this partial sulphiding may only become noticeable after some months, but is accelerated if the print is dried by heat, and in any case is liable to cause trouble in subsequent sulphide toning. The strength of an acetic acid stopbath should not exceed 2 per cent., and prints should not be allowed to remain in it for longer than 1-minute. If many prints are to be fixed at one time, it is better to transfer them from the stop-bath to a water bath preparatory to fixation. Powerful acids such as sulphuric, hydrochloric or phosphoric may give trouble even in a 1 per cent. solution. Citric and tartaric acids may be used up to 2 per cent. concentration, and sulphurous acid (the active component of potassium metabisulphite) or boric acid are safe even at higher concentrations. Potassium metabisulphite is in practice limited to about 5 per cent by its pungent odour. A disadvantage of boric acid is that its exhaustion cannot be detected by its smell. As to life, one litre of 2 per cent. acetic acid (corresponding to about a 4 per cent. potassium metabisulphite solution) can be used for about 300 9 × 12 card prints or 500 standard paper prints following a normal paper developer having about 30 gm. soda per litre, and such a bath, allowed to act for not longer than 1-minute, is recommended. Provided the pungent odour is not objected to, a 5 per cent. solution of potassium metabisulphite can with advantage replace it.-B.J., 1935, May 24, pp. 326/7.

Method of Determining Residual Hypo in Prints.—Dr. E. Weyde, of the Agfa Research Laboratories, gives the following method for determining the quantity of hypo remaining

in finished prints.

The prints are soaked for 1 to 3 minutes in a 1 per cent. solution of silver nitrate, thus converting any thiosulphate present into silver sulphide. In order to fix the resulting brown coloration the prints are briefly rinsed in water, treated for a short time in a 5 per cent. solution of common salt, fixed and washed again. Whilst the thiosulphate present in the emulsion produces a brown coloration of the gelatine which is more or less intense in accordance with its quantity, it is not so easy to judge from the appearance the quantity of hypo retained by the base, because the precipitation of the silver sulphide in a medium which of itself scatters the light makes the brown coloration appear lighter. It is best in this case to observe it by transmitted light; the silver sulphide renders the paper more or less opaque.—B. J., 1935, June 14, p. 376.

Blue Toning for Bromide Prints.—An Australian correspondent sends a modified formula for toning bromide prints to a pleasing blue colour. It is claimed for this formula that the resulting tone is a delft blue free from the vivid tinge of prussian blue usually strongly marked in blue toning. It is also claimed that experience has shown that prints toned by this method do not fade.

It is a two-bath process. The prints are immersed in the

following solution for about five minutes.

Potassium ferricyanide ... 100 grs. 11 gms. Ammonia, 10% solution 500 minims. 52 c.c.s. 10 ozs. 500 c.c.s. Water, to make ...

They are then washed until free from stain and then placed

in B until fully toned.

100 grs. B. Ferrous Sulphate 50 minims. 5.2 c.c.s. Hydrochloric Acid 10 ozs. 500 c.c.s. Water, to make ...

After again washing until free from stain, the prints are placed in an acid hypo fixing bath for one minute and washed as usual.

Maintaining Quality in Chloro-Bromide Prints.-The growing popularity of chloro-bromide paper amongst professionals and amateurs alike, is only to be expected when it is realised that with this type of paper it is possible to produce prints by direct development in a variety of pleasing tones ranging from warm-black to red chalk without recourse to any after-toning methods. These variations in tone are obtained by over-exposing and developing in a restrained developer, the warmer the tone required, the greater must be the exposure and the amount of restrainer in the developer.

Inability to obtain the correct balance between exposure and development is the chief cause of failure with this type of paper, resulting in prints lacking in full quality, especially in

the very warm tone range.

With a desire to overcome this difficulty, we have experimented with many different formulæ and methods of procedure, and have now evolved a formula which has proved very effective in our hands in producing prints which are rich

in quality and colour from varying negatives.

Working on the lines described, prints may easily be obtained from negatives of varying contrast, which maintain their quality even when developed to a warm tone. With the formula given, development time is much less than usual, red chalk effects being obtained in approximately nine minutes.

HYDROQUINONE DEVELOPER.

| A. | Hydroquinone | | | ½ oz. |
|----|------------------------|------|-----|---------|
| | Sodium sulphite (cryst | .) | | ī oz. |
| | Water, up to | | | 20 ozs. |
| B. | Sodium carbonate (cry | st.) | ••• | 2 ozs. |
| | Water, up to | • | | 20 ozs. |

For tones up to warm sepia take 1 part A, 1 part B, 2 parts water. For warmer tones, 1 part A, 1 part B, 4 parts water.

It is important to note that no further dilution is necessary, the restrainer, in the form of a 10 per cent. solution of potassium bromide, being added to produce the increased warmth of tone.

As a guide to the necessary adjustments of exposure, developer strength, and potassium bromide content, the following table should prove useful. It must be realised, however, that different makes and grades of paper may require slightly different adjustments.

| Tone | Exposure | Developer E | Extra 10% Potassium Bromide per 10 ozs. Stock Dev. | Approx. Time of Development |
|-------------|----------|-----------------------------------|---|-----------------------------------|
| Brown-Black | Normal | 1 part A, 1 part 2 parts Water | | $3\frac{1}{2}$ mins. |
| Sepia | 11 times | ,,, | 15 | 4 .,, |
| Warm-Sepia | 2 ,, | ,, | 20 ,, | 41 ,, |
| Red-Brown | 3 ,, | 1 part A, 1 part 4 parts Water | B, 40 " | 71 ., |
| Red-Chalk | 5 ,, | | 80 ,, | 9 ,, |

—H. Pulman and E. Bowden, B.J., 1935, Aug. 30, p. 552.

Improving the Permanence of Photographic Prints.—Dr. E. Weyde, of the Agfa Research Laboratories, recommends immersing prints in a bath of 1 per cent. sodium carbonate solution between fixing and washing in cases where special importance is attached to permanence, or where the time of washing has to be curtailed, and also where prints are subsequently to be toned by the indirect sulphide process. The tenacity with which the hypo is retained by the paper base increases with the acidity of the fixing bath and time of fixation in it, and if the bath contains more than 3 gm. of silver per litre, no subsequent washing will completely remove the silver thiosulphate compounds in the film and the paper base, with detriment to any subsequent toning process. The presence of a hardening agent does not materially affect the elimination

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of hypo by washing, in the case of papers, as compared with a corresponding acid bath without the hardening agent. The effect of neutralising the acid by the I per cent. soda bath after fixation is such that 10 minutes' washing in running water removes the hypo as completely as 30 minutes' washing of prints not so treated. Certain drawbacks are attendant upon the method: a liability to curl, and a tendency for slight discolouration of the whites, due to traces of alkali, on drying, particularly by heat. It is therefore recommended to restrict the strength of the bath to 1 per cent. and the time of immersion to 1 minute. Care must be taken to keep the bath up to strength on account of neutralisation by acid carried over from the fixing bath.—B.J., 1935, June 14, p. 376.

The Influence of Traces of Hypo in the Developer on the Tone of Gaslight Prints.—Dr. E. Weyde, of the Agfa Research Laboratories, has investigated the effect of traces of hypo in the developer when working with gaslight paper. It is sometimes found that the popular "blue-black" developer yields a warm black, instead of the desired blue-black tone, the effect often setting in quite suddenly with the continued use of the developer. Experiments show that this defect is due to traces of hypo carried into the developer in

the ordinary course of working.

These blue-black developers contain, as is well known, substances such as nitrobenzimidazol, benzotriazol, etc., which have a pronounced effect in promoting blue tones in gaslight papers even at very low concentration (0·05—0·1-gm. per litre of developer). This alteration of tone originates in a coarsening of the developed silver grain, and in all probability is attributable to the formation, in the alkaline developer, of difficultly soluble silver compounds of nitro benzimidazol, etc. Since hypo inhibits the formation of this difficultly soluble silver salt by transforming it into readily soluble complex compounds, it arrests the action of nitro benzimidazol and similar substances even when present in very small quantities in the developer (0·3—0·5-g.m. per litre), with the result that warm-black tones are obtained instead of the desired blueblack.

This alteration of tone in gaslight paper can, however, be observed even when ordinary developers are used, containing metol, hydroquinone, carbonate, sulphite, and bromide, if hypo is added, the effect being the more noticeable the more the normal tone of the paper tends towards blue-black.

In the case of some papers as little as 0.02-gm. hypo per

litre of developer suffices to make a distinct alteration in the tone. With most commercial gaslight papers the warmest tone is obtained by an addition of 0.5-gm. hypo per litre of developer: further additions cause the tone again to become colder. As it is generally well known that the presence of hypo is objectionable in giving rise to yellow stain, any contamination of the developer with it will, as a rule, be studiously avoided. Nevertheless, it is comparatively easy for minute quantities, such as are necessary to bring about the above change of tone, to be carried into the developer by, for instance, the hands. The ordinary fixing baths contain some 20 per cent. of hypo, so that each drop contains about 0.01-0.02-gm. of that salt. About 0.03-gm. hypo per 100-c.c.s. are sufficient to inhibit the action of the blue-black developer, so that a single drop of fixing solution may, under certain circumstances, cause trouble.

In order, therefore, to ensure uniform and entirely satisfactory tones, scrupulous care must be taken to prevent traces of hypo from reaching the developer.—B.J., May 3, p. 282.

COLOUR PHOTOGRAPHY.

The Kodachrome Colour Process.—The Kodachrome colour process was first exhibited in this country in the form of a 16 mm. cine film at Kodak House on April 25th, 1935. The process was worked out by two members of the Kodak research staff in U.S.A., Messrs. Leopold Mannes and Leo Godowsky, in conjunction with the other sections of the Kodak laboratory staff.

Kodachrome is a subtractive colour process in which the final results consist of stain images only, all the silver being removed from the film as a final step in the processing. It follows from this that there is no grain of any kind, and, consequently, the image projected on the screen is critically sharp

throughout.

The celluloid film receives five separate coatings. The first emulsion is sensitive to red, then there is a thin film of clear insensitive gelatine containing a dye to act as a filter; on that a second emulsion is sensitive to green, followed by another

thin film of plain gelatine; and finally, a third emulsion sensitive to blue is added. Each coating is exceedingly thin, so that the total thickness is little more than the ordinary Kodak ciné emulsion.

The top layer of emulsion, sensitive only to blue, transmits green and red light to the two lower layers, but it contains a yellow dye which prevents blue light from passing to the lower emulsions. The second or middle layer of emulsion is sensitive to blue and green, but as blue light is filtered out by the yellow dye in the blue-sensitive emulsion, it may be considered as a green-sensitive film only. Then the lowest emulsion is sensitive to blue and red, but, as in the case of the green-sensitive layer, blue light cannot reach it, and consequently, it can be considered only in regard to its sensitiveness to red. As in all subtractive processes, the top layer will contain, when the picture is finished, the minus blue or yellow image; the middle layer the minus green or magenta; and the lowest layer the minus red or blue-green.

Processing is divided into several stages, each being carried out on a separate processing machine. The first stage is reversing. The film is developed and a negative results. It is then bleached, cleared, printed and redeveloped. The second development is carried out with a dye-coupling developer by which a blue-green dye is attached to the silver image as it is formed. At the end of this development the film bears a strong blue-green positive image, all three of the emulsions being equally converted to blue-green, and no attempt is made in the first stage to treat them separately. The film must be dried thoroughly before the next operation is commenced.

In the second stage the blue-green stain image has to be removed from the middle layer and a magenta image substituted. In order to carry this out, the two top layers must be equally converted. The film is bleached, converting the two top layers to silver chloride, and the blue-green dye removed from them by the same operation. After exposure to light, the film is put into a dye-coupling developer which develops the silver chloride and deposits a magenta dye on the developed image. At this stage the lowest layer of emulsion is blue-green and the two upper layers magenta.

The third stage consists in treating the top layer only. The process of bleaching and redeveloping is repeated as described in the preceding paragraph, but in this case the top layer is treated with a dye-coupling developer, by means of which the silver chloride is again developed and a yellow dye deposited

on the silver. The lowest layer is now blue-green, the middle

one magenta, and the top layer yellow.

The final stage in the processing consists in removing the silver, which formed the original images in the three sensitive layers of the film. The silver being removed, dye images alone remain, forming the final picture in colours.

Exposure is made in the ordinary manner without any light filter or colour screen on the lens. Sensitivity is a marked improvement on Kodacolor, and an aperture of f/8 is adequate

for most work.—B.J., 1935, May 3, p. 275.

The Hugh Cecil Colour Print Process.—The Hugh Cecil process adapts the principle of screen-plate colour photography. in an ingenious manner, to the making of colour prints on paper with a facility equal to that of making and mounting a simple bromide print. The negative is taken as usual on a panchromatic plate through a screen, ruled with lines in the primary colours, in contact with it. A compensating filter is used on the lens. The plate is developed as usual, but the print is made on a special medium consisting of a bromide emulsion on a thin celluloid base. The print must be thinner than an ordinary transparency, and when placed on white paper should have the appearance of a good bromide print with full detail in both shadows and high-lights. In so far as the negative is made through a ruled three-colour screen and a suitable transparency made from it, the new process follows the lines of the Paget, Duplex and Finlay systems. The essential difference lies in the production of the final paper print. In the new process, the usual glass viewing screen is replaced by a sheet of paper ruled with lines in the three colours. The transparency is placed in contact with a piece of this paper, brought into register with it in the same manner as with other separate screen processes, and the two are then united, by a patent method of adhesion which is one of the chief features of the invention. The result is a print of the substance of thin card, having the appearance of a glossy bromide print in colours. The absorption of light in its double passage through the transparency and on reflection at the surface of the paper has the effect of softening the colours to a scale in which the extreme brilliance of some other colour processes is lacking, but which is claimed to be very pleasing and harmonious. The first screens are about 100 lines to the inch, but finer rulings are to be introduced.—B.J., 1935, June 21, p. 391.

The History of Colour Photography.-Photography in colours has always been the photographer's dream. Although Niépce, as early as 1822, almost arrived at the interference method perfected by Lippmann in 1891, the honour of being the first to obtain a photograph in natural colours must be given to Edmond Becquerel about 1850. In 1861 Clerk Maxwell demonstrated the practicability of reproducing colours by means of three separation negatives taken through colour filters. But the epoch-making event was the work of Louis Ducos du Hauron, who was really the pioneer of the three-separation method of obtaining negatives for producing a print in colours. His first successful three-colour prints were shown at the Société Française de Photographie in 1869. In 1876 he also suggested a tri-colour screen underlying the photographic film as in the modern screen-plate processes. A great difficulty that these early experimentalists had to contend against was the insensitiveness of their plates to yellow, green and red. In 1873 H. W. Vogel discovered the coloursensitising properties of certain aniline dyes when applied to photographic plates. This was a great step forward and many investigators explored this new field of research with the result that dyes were found which rendered plates sensitive to all visible rays of the spectrum. It is only by means of these researches that colour photography has been rendered possible. A further process was suggested by Beauregard in 1855. That is the mordant-dye method of converting the silver image into a stain image. This has been the basis of a number of modern methods in which the three separation negatives are used for producing stain-image films for the complementary colours .--B.J., 1935, Feb. 1, p. 67.

CINEMATOGRAPHY.

Acoustical Recording Device.—Further research and development work on the acoustical recording device or "autophone element" by G. L. Dimmick and L. T. Sachtleben, on the original proposals of C. A. Hoxie's "pallophotophone," have resulted in the perfection of a mechanical recording device which permits the abolition of batteries and amplifiers. etc., for combined sound-and-picture cameras for amateur portable use. The diaphragm of a mechanical microphone is coupled to the recording mirror so that variations in the sounds striking the diaphragm cause the mirror to vibrate and move the recording light-beam. The difficulties of thermal change and resonances, and the unavoidable puffs that strike the diaphragm from explosive consonants such as P and B have been dealt with by making the microphone a complete unit in a casting of aluminium throughout, with properly provided baffles and vents. The vents also serve the additional purpose of disposing of condensed moisture from the breath. Naturally due to the small size of the whole autograph element the design called for the greatest care and extremely close tolerances in manufacture. The mirror, 0.100×0.125 in. is carried upon a double-knife-edge construction, the bar being of diamond-shaped cross-section with the two edges 0.020 in. apart. The diaphragm is of special aluminium alloy of thickness 0.0016 in., centrally stiffened by concentric corrugations with a flexible outer edge, the whole assembly being very rugged. Resonances are damped out by enclosing the air-spaces behind the diaphragm with the exception of fine holes covered with a special porous paper. The whole unit is built into the back of the camera in a position suitable for the recording of personal commentaries.—J.S.M.P.E. (America), 1935, Jan., pp. 79-82.

New Portable Cine Camera.—From Germany comes news of a new portable cine camera suitable for exterior and news-reel work. It is new in that it is not merely an adaptation of some previous design but an entirely original lay-out to fulfil a definite purpose, with additional features not normally found on hand cameras of its general type. In a description of it, Dr. Ing. P. Heinisch, the Chief Engineer of the Askania-Werke, states that it requires an athlete to hold a heavy camera steadily after running with it to secure some picture, and for this reason the basic principle of the new camera

is radically different from that of its predecessors. The weight of the camera, usually due to the film stock and magazines, is carried upon the right shoulder, thus making it possible to breathe easily. At right-angles to the magazines is the driving mechanism, which partially covers the right side of the operator's face, and brings the view-finder into the right position for the right eye. The left hand fits conveniently round the circular housing of the interchangeable motor and the appropriate controls, including also that of the finder, etc., then come within easy reach. The camera is provided with a distance-meter, three lens turret on a spiral spring to facilitate easy changing and variable shutter with a large maximum opening.—Filmtechnik (Berlin), 1935, July, pp. 6-7.

Further Increase in Film Stock Speeds.—At the beginning of the summer season in America and a little later in Germany two new standard 35 mm. cinematograph stocks were introduced. The American one was the Super X Panchromatic negative, and it claimed to be much faster even than Supersensitive, though the latter might have been hypersensitized. Its increase in sensitivity to tungsten light was primarily designed to meet the need for a fine-grained material for re-photographing projected backgrounds. The development time-and an important point-is said to vary from 30 per cent. to nearly 100 per cent. more than for normal panchromatic materials. From the I. G. Farbenindustrie came the new · Agfa Type "H," being twice as fast as the previous Type "G," with a red sensitivity lying between that of the two classes of extreme red-sensitivity and the depressed red-sensitivity types. Both of these new films retain the normal grey base in order to prevent halation due to the red and yellow rays to which films of this type have an increased sensitivity.-Announced, J.S.M.P.E. (America), 1935, May, p. 111; Amer. Cine. (America), 1935, May, p. 195; Filmtechnik (Berlin), 1935, July, p. 5.

Specialised Cine Stocks.—From the technical section of the Agfa Ansco Corporation details are available of still further developments in the field of specialised cinematograph stocks. It has been realised that a "general purpose" film material in still photography is a thing of the past, and therefore the same principle must be applied to cinematography with its own rapid developments. The three new film types are titled Finopan, Infra-red and Superpan Reversible. The first, Finopan, has been developed to meet the demand for a stock of extremely fine grain. The material is fully panchromatic but owing to its particular characteristic is not so fast as the super-sensitive type of film, and naturally its contrast is higher too. Suggestions for its use in making duplicate negatives are given. The infra-red, as its name implies, is sensitised for the infra-red end of the spectrum, but also has a marked sensitivity to the blue end of the spectrum, and therefore to take advantage of its particular properties the appropriate filters must be used for haze cutting, obtaining "night effects" in daylight, aerial photography. and medical purposes. The Superpan reversible, although not yet fully developed, should offer possibilities for further investigation in the production of positives of extreme lack of grain inherent in the processing and perhaps, what is more important, that of incomparably better registration and definition due to the circumventing of the printing operation.-J.S.M.P.E., 1935, Sept., pp. 248-253.

Piezoelectric Developments.-A. L. Williams, of the Brush Development Co., describes recent researches into the functions of the bimorph elements of Rochelle salt for converting electrical into acoustical energy in connection with the reproduction of sound from sound-film tracks. Loud speakers operating on this principle are built with a motor with a double bimorph crystal element 2½ ins. square by ½ in. thick. The unit is supported inside a watertight steel case, a watertight seal being provided for the connection for the ratio-arm driving the cone. The particular purpose of these loud speakers is a compensating function to balance the normal moving-coil type loud speaker with its relatively high output in the lower frequencies. As these speakers have a negative reactance a filter is not required when they are used in conjunction with the above-mentioned moving-coil speakers; and in addition, not only do they supply the upper register, but by a tendency to correct the power factor of the dynamic speakers provide a more efficient loading of the amplifier circuit than would otherwise be obtained. Other references to this important subject may be found in Proc. I.R.E. where C. B. Sawyer discusses the Use of Rochelle Salt Crystals for Electrical Reproducers and Microphones; 19 (Nov., 1931), No. 11, p. 2020, and also in the Proc. I.R.E. in an article by S. Ballantine on the Piezoelectric Loud Speaker for the Higher Audio Frequencies: 21 (Oct., 1933), No. 10, p. 1406.—J.S.M.P.E. (America), 1935, Feb., pp. 121-125.

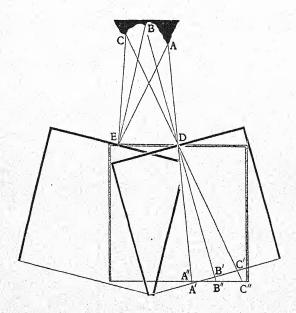
Cinematograph Patents.—It is interesting to note that during 37 consecutive weeks there were notes relating to 627 patents. These were examined and divided into three classes, the first containing all those patents relating to photographic apparatus and materials, the second dealing with cinematograph patents and including advancements in colour relating to cinematography specifically, and the last group with reference to colour patents specifically for ordinary photographic use. It was found that 49.6 per cent. of the patents fell into the first class, 40.5 per cent. into the second class, and only 9.9 per cent. into the last class. As the first class included almost anything that appertained to photography and its kindred arts, it might safely be said that at least 50 per cent. of inventive and research activities are now being devoted to cinematography. That these advancements are of importance is reflected in the improvements now demanded by users of ordinary "still" photographic apparatus and materials—the owners of miniature cameras being the first to benefit from the faster speed and improvements in quality in perforated cinematograph film. Survey made from 1935 issues of the British Journal, Jan.-Oct.

A Cine Camera with Coupled Photo-Electric Exposure Meter.—From Vienna comes the news of the first camera with automatic exposure setting, and the first application of this new principle is to 16 mm. film. The Eumig camera, which breaks this new ground, is equipped with a selenium photo-cell, in front of which is an iris diaphragm coupled to the camera lens diaphragm. As the iris is opened or closed, the photoelectric current generated by the cell varies with it, and causes the pointer of a moving coil galvanometer to move across the field of the viewfinder, in the centre of which is a cross indicating the setting for correct exposure. It is, therefore, only necessary to sight the object as usual, and to set the diaphragm so as to bring the pointer on to this central cross, whereupon the stop is automatically set for correct exposure. The angle of view of the photo-cell has been carefully adjusted to that of the camera, so that false readings due to bright objects outside the picture are avoided. The use of filters is provided for: a duplicate filter placed on the photo-cell automatically applies the necessary multiplying factor. The system is claimed to work equally well with daylight and with artificial light, as the selenium cell measures, for practical purposes, only the actinic light which affects the emulsion.—B.I., 1935. July 26, p. 468.

STEREOSCOPIC PHOTOGRAPHY.

Convergent Cameras.—We reproduce from *Nature* the following interesting note on Stereoscopic Photography, by Dr. John R. Baker, of the Department of Zoology and Comparative Anatomy, Oxford:—

It is sometimes stated that in the stereoscopic photography of near objects it makes no difference at all to the images whether the cameras are placed parallel to one another, or convergent upon the object.



In the illustration the object to be photographed has three distinct points upon it, A, B and C. The thick black lines indicate the outlines of the camera in its two positions for obtaining convergent views of the object. The angle of

convergence shown is purposely made greater than the greatest angle of convergence possible with normal vision, so as to exaggerate the point that is to be made. An exactly similar camera is also shown in the position it would occupy for the right-eye view, if photographs were going to be taken with parallel cameras. The outline of this camera is indicated by dots between lines. For the sake of simplicity pin-hole cameras are represented. The apertures of both pairs of cameras are at \hat{D} for the right-eye view and at E for the left-eye view.

The right-eye convergent camera produces images of the points A, B and C at A', B' and C'. The right-eye parallel camera produces the images at A", B" and C". Now A'B' exactly equals B'C', while A"B" is less than B"C". Therefore the view obtained with the convergent camera is not the same as that obtained with the parallel camera.

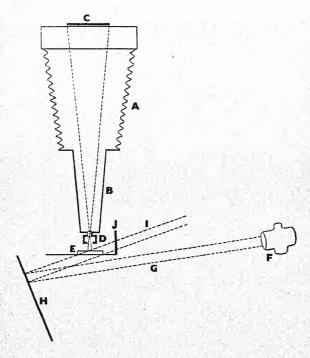
Which is the proper position of the camera for the representation of normal binocular vision as closely as possible? Imagine an eye situated at D. The owner of the eye would notice that the angle subtended between A and B was exactly equal to the angle subtended between B and C. In making an accurate drawing of the appearance of the object from his viewpoint, he would therefore make AB exactly equal to BC on his sheet of paper. This is what the convergent camera does. The convergent camera therefore gives the proper representation of the object.

The parallel camera has the advantage of giving a larger field of view in focus at the same time, if lenses of wide aperture are used and if the object presents a more or less flat surface at right angles to the axis of the cameras; but its image is not absolutely accurate. It must be remembered that in stereoscopic photography we rely for our effects upon the minute differences between the two prints, and extreme accuracy is therefore important if a truthful appearance is to be given.

The facts stated in this note give support to the tilting-stage method of stereo-photomicrography, for in this method the two views are convergent. The other method, in which the object is photographed first at one side of the field of view and then at the other, and the two photographs treated as a stereoscopic pair, is equivalent to the use of parallel cameras.—Nature, 1935, Aug. 3, page 193.

PHOTOMICROGRAPHY.

Low-Power Dark-Field Photography.—The photography of bacteriological cultures in Petri dishes has peculiar difficulties of its own, due to the cultures generally being on a transparent medium showing no contrast by ordinary transmitted light. Oblique reflected light is unsatisfactory, as



A—Camera; B—Extension Box; C—Plate; D—Lens Hood; E—Plate Glass Support for Subject; F—Focussing Spot-Light; G—Beam of Light; H—Mirror; I—Reflected Beam; J—Shield to prevent any direct light from striking the subject.

medical men are accustomed to examine such specimens by transmitted light, and a photograph so taken would rarely

convey the impression desired.

Such cultures are commonly required to be photographed as a whole and in comparison with a second culture, and in part, which resolves itself into low-power dark-field photomicrography. The method is not only of interest to scientific workers, as the principle can be applied to any transparent subject lacking in contrast, making what appears to be unphotographable into a simple matter of correct lighting.

As some method had to be devised, it was found that a mirror placed at the correct angle-slightly less than 45 deg., as shown in the diagram—to illuminate the subject brilliantly, with a beam of strongly oblique light reflected from it, the remainder of the mirror remaining unilluminated, gave the dark-field rendering.—R. V. Dent., B.J., 1935, Aug. 16, p. 515.

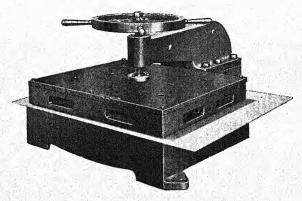


APPARATUS AND MATERIALS.

THE "V" DRY MOUNTING PRESS.

(Made by the Adhesive Dry Mounting Co., Ltd., 27/28, Fetter Lane, London, E.C. 4.)

This new addition to the well known range of this firm's dry mounting presses represents a great advance in that it is built on the cantilever principle, admitting of handling very much larger work. The "V" press has a heating plate, 21×25 ins. and will mount a print 20×24 ins. in one pressure on a mount up to 32 ins. wide and of any length, or a continuous strip up to 44 ins. wide in a

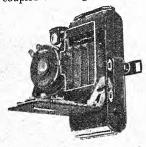


series of pressures, whilst 20×30 poster work, for instance, can be mounted in two pressures. The machine has in fact been designed especially for large showcard work. Two models are available; heated by gas the price is £30, whilst the electric model costs £38. The design, as may be seen from the illustration, is on exceedingly clean and modern lines and the machine is very convenient to handle.

THE ENSIGN AUTO-RANGE CAMERA.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

This $3\frac{1}{4} \times 2\frac{1}{4}$ in. folding film camera is British made throughout and possesses the very desirable feature of combining rangefinder-coupled focusing with the provision of a rising and cross front.



The self-contained design of range-finder renders this possible. The camera has many other excellent features. The rangefinder itself is easy to use, the double image being always clearly visible. Focussing is by a very convenient lever, with positive infinity catch, and is scaled in feet and metres. The eyepiece of the rangefinder and the frame finder aperture are side by side, and there is also an excellent reversible brilliant finder. The rising front has an instantaneous lever

motion; there is nearly $\frac{1}{2}$ in. rise, and $\frac{3}{6}$ in. each way cross front. Other good features are the position of stop and shutter speed scales on top of the shutter mount, in full view when the camera is in use; the wire release, so arranged that it can be left attached when the camera is closed, a new and convenient type of catch for the back, and a double spring hinge which allows the whole back to fall clear of the camera without risk of straining the hinge. The price of the camera, with Ensar $\frac{1}{4} \cdot 5$ anastigmat in Mulchro shutter—an accurate shutter speeded from 1 to $\frac{1}{100}$ second—is £7 10s. 0d.

CRITERION LUSTRA SURFACE MEZZOTONE PAPER. (Made by Criterion, Ltd., Stechford, Warwickshire.)

This is a new surface, an idea of which is best conveyed by the maker's own description-a crushed rough grain. It has a lustre that provides brilliance, whilst the grain gives luminosity in the shadows. The paper is, of course, a chloro-bromide, and gives the usual range of warm tones by direct development. Using an M.Q. developer made up to the formula recommended in the instructions, a very pleasing warm black was obtained, giving a very rich result against the deep cream of the base. With weakened developer and the addition of bromide, a 10 x exposure gave a pleasing warm sepia. It is interesting to note that a particularly effective result can be obtained in the case of certain high-key work by still further increasing the exposure, as the cream base and thin warm toned deposit then combine to a very warm tint in the high tones. In speed, we should judge the paper to be about one-half to one-third as fast as an average bromide paper of similar grade. Developed normally, it is of normal to vigorous contrast, softening, of course, with increasing warmth of tone, until at a warm sepia it becomes as soft as the softest grade of bromide. The paper gives satisfactory tones when sulphide toned.

NEW OPTOCHROME FILTERS.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

Optochrome filters need no introduction, and the filter sets have already found much favour particularly among owners of the



cameras for which they are supplied in special mounts. Two new filters will therefore be of interest. These are a blue filter for panchromatic materials and artificial light, and a green filter, in two densities, for general use with ortho or panchromatic materials. Full details of these filters, with absorptions as measured on the Agfa Colour Chart, are contained in a leaflet which Messrs. Sands, Hunter, will gladly send on request.

THE DALLAN AUTO SPEED WASHER.

(Made by David Allan, Whitfield Works, Mansfield Street, Kingsland Road, London, E. 2.)

The new Dallan Auto Speed Washer is the latest development of the well-known circular series of washers made by this firm, made rectangular for economy of space, and improved in other ways.



These washers work on the only sound principle continuous agitation of the water and a complete change of water every few minutes. The tank itself is of large capacitythe 12×10 size which we examined measures nearly $14 \times 12 \times 6$ ins. deepand has well rounded corners. . It stands on feet 2½ ins. high, which both raise the tank well clear of the sink in which it stands and also allow of an adequate head of water for rapid automatic changing. The water enters through a series of jets at all four corners,

and when it reaches a certain level syphons rapidly off, leaving only sufficient water to accommodate the prints in a floating condition prior to the refilling of the tank by the jets, which continuously and thoroughly agitate the whole volume of water. The efficiency of the washer is readily tested by colouring the contents strongly with permanganate of potash: the colour is practically cleared in two operations. A more effective, convenient and well made washer it would be difficult to imagine. It is finished in white enamel inside, chocolate out, and is made in six sizes, from 1-plate, selling at 12s. 6d., to 24 × 19, which is priced at 50s.

THE CONTAFLEX CAMERA.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

The Contaflex is entirely unique. It is a twin-lens reflex camera taking 36 exposures on ciné film and is a pioneer in three respects. Firstly, it has a built-in photo-electric exposure meter, which works



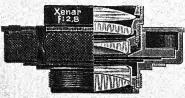
on the Helios principle. Secondly, it is fitted with a metal focal-plane shutter, similar to that of the Contax, but equipped with a delayed action mechanism. Thirdly, it is the first reflex camera which can be fitted with ultra-rapid lenses of as wide an aperture as f/1.5. It is proposed to supply, as interchangeable lenses, a Tessar $f/2 \cdot 8$, Sonnars f/2 and $f/1 \cdot 5$, and $3\frac{1}{8}$ and $5\frac{1}{4}$ in telephoto lenses; the new type bayonet mount for changing the lenses is extremely rapid and con-The reflex objective is a venient. special $f/2 \cdot 8$ Sonnar of longer focal length-8 ins.-than the standard camera lens, giving an image on the special "full illumination" convex focussing screen large enough to see clearly what is otherwise a small picture, and in addition a magnifier is provided in the hood. A direct Albada

finder is also provided in the hood, showing clearly both the 2 in. and 3% in. focus frames, and is invaluable for sports photography. The film transport mechanism is coupled to the shutter wind, so that the camera can be used continuously on the wind-snap principle. The Contax-type shutter gives exposures from \(\frac{1}{2}\)-1/1000 second. Altogether the Contaflex is a great advance in camera design and its precision of manufacture is fully up to the Zeiss Ikon standard.

SCHNEIDER XENAR F/2.8 ANASTIGMAT.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

Jos. Schneider & Co., of Kreuznach, are well known for their short focus anastigmats, as fitted to high class miniature cameras.



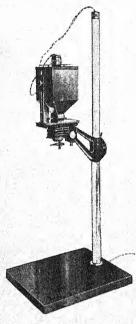
The new lens—the S-Xenar -is a 5-lens anastigmat with one cemented pair of components. This design has been found to give excellent results, the angle covered being 60° and the field flat and well illuminated to the corners. Details of focal lengths and prices can

be obtained from Messrs. Hunter, or in the U.S.A. from Mr. Burleigh Brooks, 127, West 42nd Street, New York.

THE SAYCE-WATSON UNIVERSAL CAMERA.

(Made by W. Watson & Sons, Ltd., 313, High Holborn, London, W.C. 1.)

The suitability and growing use of standard 35 mm. ciné film for record purposes of all descriptions has led Messrs. Watson to design a really universal camera with which copying, photomicrography



and general photography of a technical nature can be done, and prints, enlargements and lantern slides made from the results, with the minimum of apparatus and the utmost simplicity of manipulation. As regards the convenience of storage of the resulting negatives, it is pointed out by the makers that the four thousand negatives taken over two years with the experimental model of this camera were filed in a cabinet measuring $15 \times 6 \times 5$ ins. The apparatus consists of a universal stand, shown in the illustration, which forms the basis of all equipments. The camera itself is quite unique, and owing to its separation into two parts-lens bracket, with Watson $f/6 \cdot \hat{3}$ anastigmat lens, and camera body-admits of the use of the focussing screen on all occasions, the camera body with the film magazine being instantly slid into place when all adjustments have been made. All printing is by enlarged projection, and the illustration shows the apparatus set up for this purpose. Altogether, for use in laboratories and institutes requiring to do a variety of photographic record work, this camera should be invaluable, and we should judge that

it will find its place also in many commercial photographic studios. The price, complete with all accessories, is £36.

PERNOX PANCHROMATIC FILM.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

Users of Pernox Ortho film will welcome the advent of this finegrain panchromatic Pernox, which on test seemed to us rather faster than the orthochromatic variety, although rated the same—26° Scheiner or 16/10° Din. In quality it is quite up to the same standard; it has a wide latitude and gives ample density without harshness, and with the minimum of fog. Colour rendering is good, the green sensitivity being high, and the red ample, but not excessive. A green anti-halation backing, which dissolves off in the developer, is effective in preventing halation.

THE LEICA MODEL IIIA AND NEW LENSES AND ATTACHMENTS.

(Sold by E. Leitz (London), 20, Mortimer Street, London, W. 1.)



The new Leica Model IIIa possesses all the features of the Model III and in addition an extra shutter speed of 1/1,000 sec. making 13 speeds in all from 1 to 1/1,000 sec. The price with f/2 Summar lens is £43.

Several new lenses now available which considerably

increase the scope of the camera. The Leitz Hektor 2.8 cm. f/6.3 is a 76° extra wide angle lens, automatically coupled to

the rangefinder, and costs £10 14s. in nickel finish, chromium 4s. 6d. extra. Another new departure is the Leitz Thambar 9 cm. rangefinder-coupled controllable diffusion portrait and landscape lens: at $f/2 \cdot 2$ downwards this gives a decreasing of. diffusion degree until at $f/6 \cdot 3$ the definition is

Webstan

absolutely sharp throughout the whole field. The Telyt is a de luxe $f/4 \cdot 5$ telephoto attachment

of 20 cm. focal length (see illustration) which at the same time converts the camera into a reflex with ground-glass

screen and 5 x and 30 x magnifiers. Thus critical focussing is obtained with four times the normal size of picture.

Two new accessories are deserving of special notice. One is a table top stand which, when attached to the Leica, enables the latter to be stood on any flat surface, vertically or horizontally, and tilted at will through a considerable angle.

The other (see illustration) is a rotating carrier stand for copying, or photographing at close quarters at any angle or distance, the object being critically focussed on a ground glass screen and the camera then swung round on its disc so that the film takes the place of the focussing screen. The price of the table top stand is

£1 2s. 6d. and of the rotating carrier stand £13 4s. 6d.

JOHNSON'S "CONTRAST" DEVELOPER.

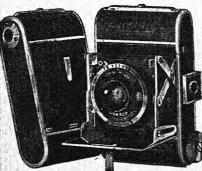
(Made by Johnson & Sons, Manufacturing Chemists, Ltd., Hendon, London, N.W.)

This developer is issued in a concentrated form to be diluted by adding 4 parts of water to 1 of the developer for general work, or 9 parts of water for obtaining softer results. It is primarily intended for bromide prints and enlargements for Press and commercial photography, though, from our tests, it appears to be equally suitable for all general work in negative-making and gaslightprinting. It is very rapid in action, and the resulting prints or plates are brilliant and absolutely free from any stain, chemical fog or defect. A bromide print on normal paper is developed in about 60 seconds, and a negative of an average subject in about 2 minutes, or rather longer if sufficient contrast is required for contact printing. The solution remains free from discoloration during development, so that it may be used for several plates in succession. We can confidently recommend it to the busy Press man, whose time is important: it combines rapidity and quality, and there is no loss of contrast or brilliancy when used for several plates.

THE GOLDI 3 × 4 cm. AND 4 × 6 cm. CAMERA.

(Sold by Luminos, Ltd., 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4.)

The Goldi is an exceedingly sound little camera. The miniature model takes 16 pictures on a V.P. spool. measures only $4\frac{5}{8} \times 2\frac{5}{8} \times 1\frac{1}{4}$ ins., and weighs about $12\frac{1}{2}$ ozs. The V.P. size is only $\frac{5}{8}$ in.



longer and 11 oz. heavier. A feature at once apparent is the smooth opening and closing mechanism. On releasing the catch, the baseboard springs open and the front is pushed forward with a perfectly parallel motion, and locked by a patent catch with great rigidity. There is thus no tilting of the front, or distortion of the bellows, and there is none of that rather disturbing resist-

ance often experienced in closing self-erecting cameras. Several other excellent features, though small in themselves, go to make the Goldi a most convenient and efficient camera. Prices range from £4 with a 5 cm. $f/4 \cdot 5$ Zecanar anastigmat in Vario shutter, to £10 10s. 0d. with $f/3 \cdot 5$ Leitz Elmar in Compur. The most popular model is perhaps that with an $f/2 \cdot 9$ Zecanar in Compur, at £7 7s. 0d. The shutter is speeded to 1/300 sec., and the lens is focussed votating the front milled ring. The V.P. size is also supplied with a range of lenses and shutters from £4 7s. 6d. to £8 15s. 0d.

THE LEICA MANUAL.

(Sold by Wallace Heaton, Ltd., 119, New Bond Street, London, W. 1.)

The Leica Manual, published by Willard Morgan in New York, is certainly by far the most elaborate and compendious vade mecum for the Leica worker yet published. It is a 500-page volume with 300 illustrations, and nearly twenty acknowledged Leica experts in their various branches have collaborated to make this book an exceedingly fine guide to the mastery of the many phases of photography—general, technical and scientific—possible to the Leica. The price is 21s. 0d., postage 6d.

DUFAYCOLOR COLOUR FILM.

(Made by Ilford Limited, Ilford, London.)

The Dufaycolor process is by now probably too well known to call for any description. Briefly, it is an additive process utilising a ruled screen incorporated in the film itself, between the emulsion



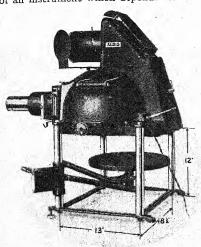
and the base, through which the exposure is made. The film is subjected after exposure to the usual colour plate reversal process and emerges as a positive transparency. The film differs from former processes in, among other things, the extreme fineness of the screen, which is not obtrusive even when 16 mm. film is projected, or Leica positives scrutinised. Another characteristic is its

speed, which is about one-third that of standard Selo rollfilm, or 250 H. & D. Dufaycolor rollfilm and Leica film, which is loaded and used in exactly the same way as ordinary film, is moreover used in daylight without any filter—an important feature. For other forms of lighting and with film pack and ciné film special filters are needed: a filter is supplied in every carton of ciné film. Processing of Dufaycolor is undertaken by Ilford Limited through their recognised dealers, and most users will prefer to avail themselves of this expert service, but processing instructions are issued, and have been worked out for simplicity and maximum latitude of exposure. Dufaycolor is supplied in 6-exposure rollfilm spools for $3\frac{1}{4} \times 2\frac{1}{4}$ and $4\frac{1}{4} \times 2\frac{1}{2}$ in. cameras; as flat film and 8-exposure film packs for $4\frac{1}{4} \times 6$ and 9×12 cm. and $3\frac{1}{4} \times 2\frac{1}{4}$ and $4\frac{1}{4} \times 3\frac{1}{4}$ in. cameras. For miniature cameras it is supplied in the standard Ilford 18-exposure daylight loading casettes; for ciné cameras in 16 and 9.5 mm. daylight loading spools and in standard 35 mm. ciné film. Examples of prices are: $3\frac{1}{4} \times 2\frac{1}{4}$ roll-film, 3s. 4d.; film pack 8s.; miniature spool, 6s. and 50 ft. 16 mm, ciné spool £1 1s. Processing is extra for roll film and film pack, inclusive for ciné film. A useful if not indispensable accessory for Dufaycolor roll film workers is the little viewing box for the finished transparencies. It costs only 5s. 6d., and takes both popular sizes of rollfilm and includes a glass filter enabling the viewer to be used by artificial as well as daylight.

THE ALDIS EPIDIASCOPE.

(Made by Aldis Brothers, Sparkhill, Birmingham.)

Aldis lenses are world-famed, and it is not surprising therefore that their makers have turned their attention to the manufacture of an instrument which depends for its value on the perfection of



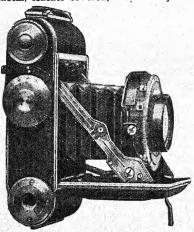
its lens-the Epidiascope. Weighing only 544 lbs., and standing less than 32 ins. high, this instrument comes into the portable class, whilst giving the performance of a much larger instrument. 500-watt automatic focussing lamp, reinforced by fourteen silvered reflectors, will thus project a 9.4 in. circle to a maximum diameter of 13 ft. 10 ins. at a distance of 28 ft... whilst it can be focussed as near as 12 ft., giving a 5 ft. 7 in. picture. Lantern slides can be projected to a size of of 6×6 ft. with the full artificial lighting of the

room undimmed. The optical efficiency and the unique design of the ventilating system have enabled a cooling fan to be dispensed with. It is perhaps chiefly in the matter of convenience, and clever design that this new epidiascope most impresses us. It is thus particularly easy to insert awkward and bulky objects-even the upper portions of a 9 in. terrestrial globe can be projected—and the spring-controlled 15 in. elevating table swings instantly out of the way for the purpose. The self-capping change-over mechanism from epi- to diascopic projection is equally effective and very simple in construction, whilst a dimming cap ensures equal illumination on the screen for both types of projection. Even a pointer, of rustless steel, is incorporated to enable the operator to point out features of the object under projection. A further refinement is a magazinea unique device patented by the manufacturers-by which up to 50 diagrams or post cards can be projected in order by operating a The lens is an Aldis 18½ in. Anastigmat Episcopic slider frame. Projection Lens and covers the required area with perfect definition. The price of the Episcope alone is £38, while the complete Epidiascope, as illustrated, is £42, and the purchaser of the simple Episcope can subsequently transform his instrument into a complete Epidiascope by purchasing the Diascopic snout fitting as an attachment which is easily substituted for a plain sheet aluminium front panel.

THE ROLL-OP II MINIATURE CAMERA.

(Sold by Garner & Jones, Ltd., Polebrook House, Golden Square, London, W. 1.)

This is a rangefinder-coupled camera taking 16 pictures on a $3\frac{1}{4} \times 2\frac{1}{4}$ in, spool, with several special features. The case is all metal, leather covered, and is very well made. The self-erecting



front springs open gently, but positively, and is easy to close. In addition to Plaubel telemeter (rangefinder), which works on the principle of coincidence of a divided image along a line of separation, an optical viewfinder is provided. The automatic spacing device to the film wind is simple, quick to operate and certain in action. Consecutive frames are brought accurately into position by the operation of a spring catch which engages in notches on a counting disc graduated to compensate for increasing spool diameter.

changing is very convenient, swing-out cradles acting as spool holders. A good positive red-window protection is provided. The camera is fitted with a 7.5 cm. 4-lens f/2.8 anastigmat and Compur Rapid D.A. shutter speeded to 1/400 second. The price is £21.

THE DUXOCHROM COLOUR-PRINT PROCESS AND BERMPOHL THREE-COLOUR CAMERA.

(Sold by Johannes Herzog & Co., Hemelingen, Bremen, Germany.)

Colour photographs of wonderful truth and brilliance can be produced by the Duxochrom process, with greatly increased simplicity and speed as compared with methods hitherto regarded as standard. Enlarged negatives are not required, the actual film exposed by contact or enlargement being stripped off and used in the final print. Messrs. Herzog maintain a specially equipped factory service for printing from customers' negatives, operated by a highly skilled staff, for the benefit of those who do not wish to do their own processing. As for all paper processes, three-colour separation negatives are of course needed, which for still life and similar subjects may be produced with an ordinary camera and tricolour filter slide, but for subjects showing movement a one-exposure three-colour camera is essential. An excellent camera of this type is the Bermpohl, which is supplied complete with the necessary screens for daylight, arc or incandescent light for Ilford or Kodak materials, and gives colours true to nature.

ETCHADINE-A NEW RETOUCHING SYSTEM.

(Sold by George H. Potts, Ltd., 7/9, Baker Street, London, W. 1.)

Etchadine is a new power in the hands of the retoucher, whether professional or amateur. Briefly, it is a chemical reducing agent which can be used on any surface, of negative and print alike; it



completely under control. and can applied either broadly or extremely locally with a fine brush. Practically any form of retouching can be carried out with the minimum of. experience. Apart from retouching, Etchadine provides a method of local multiple toning which is certainlyunequalled and limited only

by the range of tones available by bleach methods. The simplicity and versatility of the process are certainly remarkable. The necessary reagents are put up in 4 bottles, with special dropping-tube stoppers for the-two reagents of which small measured quantities are needed, in a convenient cardboard container, and sold at 25s. the set.

THE ROTH NEW SMALL UNIPOD.

(Sold by A. O. Roth, 85, Ringstead Road, Catford, London, S.E. 6.)

A new, and very useful, size is to be added to the well-known pair of Roth Unipods. The Unipod is a single legged telescopic support—a tripod with one leg, so to speak—which takes the weight of the camera, and by restraining its possible motion to one of rotation about the bottom point of the Unipod, greatly reduces camera shake and makes even slow shutter exposures safe. The miniature camera worker in particular finds the Unipod an invaluable accessory that is far more easily carried than a tripod, and not the trouble to set up. The standard Unipods are 10 and 13 ins. long when closed, and open out to full length. The new model is only 6 ins. long closed, and extends to 12 ins., being intended for use only with the neck strap and socket support supplied with it, whereby the weight of the camera is taken from the neck and both hands left free for manipulating the camera. The new model should be popular both with miniature camera users and with owners of the lighter types of ciné cameras.

TETENAL ULTRAFIN SF DEVELOPER.

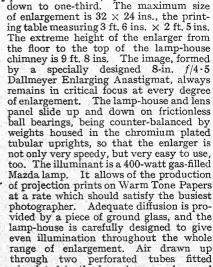
(Sold by Wallace Heaton, Ltd., 119, New Bond Street, London, W. 1.)

There is more than one fine-grain developer which can be used quite safely more than once, the objection being, however, that the gamma, or contrast, of the resulting negative is uncertain for the second and subsequent films. Tetenal Ultrafin, which can be used as many as six times for Leica and other small films, is sent out complete with a table of correct development times for each successive time that it is used, and for all the best known makes of film, so that a uniform quality of negative is assured. The negatives produced by it are of exceedingly fine grain, resembling those produced by paraphenylene diamine, but the Ultrafin is non-poisonous, and non-staining, and calls for no special precautions and no increased exposure. It is claimed to be superior to paraphenylene diamine in the matter of bringing out shadow detail, and tests seem to show that the claim is justified. The price, per carton making 600 cc. (18 oz.) is 4s. 0d.

THE KODAK PROFESSIONAL ENLARGER.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

The professional Enlarger is a vertical, automatic-focussing enlarger that takes negatives up to $8\frac{1}{2} \times 6\frac{1}{2}$ ins., gives a maximum enlargement of 5 times a 1-plate or 4 times a 1/1 plate, and reduction

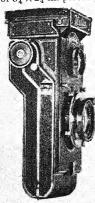


below the diffusing glass, circulated in the lamp-house and passed out through the chimney, provides efficient ventilation. Two sheets of plain glass placed above the negative carrier protect the negative from heat; it remains at a perfectly safe temperature even after long periods of continuous working. The negative carrier has a universal movement and a masking device for negative composition is fitted in the lamp-house. Exposures are made by means of a foot switch, both hands being left free for shading or other control work. For portraiture, commercial and all other work that necessitates the rapid production of prints of the highest quality, the Kodak Professional Enlarger is certainly well equipped. The price, complete with 400-watt lamp, plain paper board, foot switch, and one 8-in. $f/4\cdot5$ Dallmeyer lens, is £77.

THE WELTA SUPERFEKTA 31 × 21 CAMERA.

(Sold by Peeling & Van Neck, 4/6, Holborn Circus, London, E.C. 1.)

This twin-lens collapsible mirror-reflex camera is distinguished by the fact that it is the only such camera to take a full 6×9 cm. or 31×21 in picture. By a most ingenious construction the camera



is not only collapsible to remarkably small dimensions, but has a reversing mechanism which by a simple twist of the whole back not only turns the film from the normal vertical into the horizontal position, but also reverses a mask beneath the reflex focussing screen into the corresponding position so that the actual boundaries of the picture are seen clearly defined on the screen. The camera opens instantaneously to the vertical position and is rigidly locked; it closes equally instantaneously. Such refinements as an automatic film counter and focussing magnifier in the hood are of course incorporated in an instrument of such ingenious design. With an f/3.8 Tessar, Weltaskop finder lens and Compur D.A. shutter speeded to 1/250 sec., the price of the camera is £27 10s., and it may also be had, at corresponding prices,

with Trioplan lenses and also with the D.A. Compur Rapid shutter.

THE AGFA DIN EXPOSURE GUIDE AND FILM SPEED CHART.

(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

A handy little circular metal calculator is made by Agfa, and sold at the modest price of 9d. It is worked on the additive factor system, and is very convenient in use. All the data for daylight exposures—time, weather and subject tables—are on the back of the calculator itself, whilst the calculator will also give exposures for a 500-watt Nitraphot lamp and reflector for distances from 3 to 36 ft. from lamp to subject. A new film chart has also been issued giving the speeds of all current Agfa films. This is of particular interest in view of the recent alterations, both in speed and name of some of the Agfa films.

THE TEMPOPHOT PHOTOELECTRIC EXPOSURE METER.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

This small, light, but efficient meter introduces a new, and patented feature which reduces reading to the utmost simplicity. The pointer scale, which is of necessity uneven, is connected by "channels" with a uniformly divided scale of



exposures, thus enabling the slide rule principle of exposure calculation to be applied direct to it for the purpose of setting plate speed and stop. In practice it is only necessary to set two pointers to these values and point the meter at the subject, when the exposure is read right off. Speeds are given in Din and Scheiner, and stops in both English and Continental values. Normally, the meter is very sensitive, reading to about 1 ft. candle, but a ninety per cent. "throttle" can be introduced by the turn of a pointer when conditions are very bright. The meter is robust

in construction, the "eye" well protected and the case dust proof. A neat morocco pouch with zip fastener completes a well finished job. The price of the instrument is £3 5s. 0d., and of the pouch 5s. In addition to the standard model, a special new model is now made exclusively for use with Leica cameras. The price of this is £3 10s. 0d., pouch 5s. extra.

THE KODAK REGENT CAMERA FOR 8 AND 16 PICTURES ON A 620 SPOOL.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

This camera will, we understand, not be available until about the middle of March, 1936. We have, however, been privileged to examine an advance model, from which we can say that it is of quite



novel design. As can be seen from the illustration, it is of "streamline" design, ideal for the pocket, and-this is a really novel feature—not only the rangefinder, but also the viewfinder when closed are both so built in as to present a perfectly smooth contour; the viewfinder springs open for use at a touch. Focussing, which is rangefindercoupled, is by a milled head in the conventional position on the right hand of the baseboard, the focussing scale, graduated down to 3 ft., being across the front of the baseboard with a moving pointer as indicator. The rangefinder itself is easy to use; the main field is tinted yellow, and the coincidence field forms a bright, untinted spot in

the centre which is instantly picked up. The lens is a 10.5 cm. f/4.5 Xenar, in D.A. Compur Rapid shutter speeded to 1/400

A special release is incorporated which makes the camera second. easier to operate in either position than would be the case with the ordinary trigger. The back of the camera has a very deep light trap and a good clasp. Loading is made easy by a novel toggle motion of the spool pivot which obviates the necessity for pulling out the winding spindle for loading. This enables a pull-out motion to be provided for the purpose of an easy grip on the winding head. The same device is adopted on the feed-spool. A good protecting slide is provided for the two red windows. The half-size frame is obtained by inserting two separate half masks from each end over the film rollers. This seems an easier method than the usual spring mask. Corresponding half masks, permanently mounted on the viewfinder, are put in and out of action by a touch. One small, but good feature, is the impossibility of damaging the camera by trying to close it with the lens not racked backed to infinity. Unless in this position the baseboard is locked. Altogether the camera is well made and well designed, and a worthy addition to the Kodak range.

M. & W. FILMARUS AND FILMAREX ENLARGERS.

(Sold by R. E. Schneider, 189, The Grove, W. 6.)

Messrs. Müller & Wetzig, of Dresden, are the makers of perhaps the largest range of enlargers in the world, and these four instruments, for miniature negatives up to 6.5×9 cm., have been selected as



amply satisfying the requirements of the miniature worker, and particularly the finisher, in this country. All have a quick one-hand lever rise and fall with automatic locking, and the whole enlarger is extremely rigid and capable of withstanding hard usage. The lenses are special enlarging double anastigmats of M. & W. make, and the illumination is by a 100-watt lamp and condenser. Filmarus O enlarges from 3 × 4 cm. negatives from 2 to 8.5 times; Filmarus I: 4 × 4 cm., 2 to 10X; Filmarex O:

 6×6 cm., $1\cdot 5$ to 7X; and Filmarex III: $6\cdot 5\times 9$ cm., $1\cdot 5$ to $6\cdot 5X$. Filmarus O has an $f/6\cdot 3$ lens, the others all $f/4\cdot 5$.

NOVEX GASLIGHT PAPER: NEW GRADING. (Made by Kosmos Photographics, Ltd., Letchworth, Herts.)

Those who need a gaslight paper that can be relied upon to give the best from every negative should investigate the capabilities of the new Novex—new, in the sense of improved, for Novex has long held an honoured position among gaslight papers. Recently the grading has been re-adjusted, and a fourth grade—improved extra contrasty—added, and the four grades certainly cover every range of contrast likely to be met with in practice. Novex is a clean-working paper, giving prints of excellent colour and will permit considerable liberties in respect of exposure and development. In its new grading it should prove very popular.

THE NOVIFLEX REFLEX CAMERA.

(Sold by Luminos, Ltd., 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4.)

The Noviflex is a mirror reflex focal plane camera taking 12 $2\frac{1}{4} \times 2\frac{1}{4}$ in pictures on a standard 20 spool. The outstanding features are simplicity and convenience. The focal plane shutter,



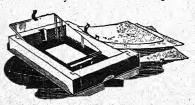
speeded from 1/20 to 1/1000sec. is quiet and reliable, and is set and wound in two movements of the head on the left of the illustration. A special release provides for The film, time exposures. once set on '1' at the window, automatically records on a counter by passing over a rubber roller which takes the place of one of the ordinary film guide rollers. Focussing, by a large milled head operated by the left hand, is facilitated by a mag-

nifier which springs into position as the hood opens. The release is a large lever, conveniently placed, and we found the whole manipulation of the camera convenient and conducive to steady holding and quick work. There are three lenses to choose from—Ludwig Victar, Meyer Trioplan and Schneider Xenar, in each case either f/3.5 or f/2.9. Prices range from £10 10s. to £16 10s., the leather case being 17s. 6d. extra.

THE S.H. GRAVURE ENLARGING FRAME.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

Since the very early days of photography, modifications of the "bolting silk" method of securing diffusion in enlargements have been in fairly constant use despite the numerous lens diffusion



devices which, however, could never entirely replace them. The S.H. Gravure Frame reduces the bolting silk device, usually more or less haphazard, to scientific method, utilising special screens of a clear, washable substance resembling celluloid, but non-inflammable.

These are embossed with patterns of various kinds—"Etching, Linen, Tapestry"—which produce correspondingly varying effects, according to the position of the screen in contact with or separated from the paper, and according also to the relation of screened and unscreened exposures. The frame takes paper up to 12×10 with three masks for smaller sizes. The price of the frame, complete with screens, is £2 2s. 0d.

THE "WELLCOME" EXPOSURE CALCULATOR, HANDBOOK AND DIARY FOR 1936.

(Sold by Burroughs Wellcome & Co., Snow Hill Buildings, London, E.C. 1.)

There can be few photographers who are not familiar with this little green handbook which contains, in addition to a wealth of photographic information, one of the most reliable exposure calculators ever produced. This year it appears in its usual familiar form, but a comparison against last year's edition reveals much careful work in keeping abreast of the times. Plate and film speeds have been brought right up to date—a most valuable feature in view of the many recent developments in this direction. Those who do not know the "Wellcome" calculator should not fail to note that it contains a table of effective speeds of practically every material on the market, including colour and infra-red materials. The calculator itself has been modified to allow for increased speed of materials available. In many other respects also the handbook has been brought up to date, whilst the diary and exposure record are of course retained in their original form. The price, as before, is 1s. 6d.

THE "STANDARD-DE-LUXE" BINOCULAR.

(Made by Dollond & Aitchison, Ltd., 192, Tottenham Court Road, London, W. 1.)

The light-weight binocular is now an established fact, and Messrs. Dollond and Aitchison are to be congratulated on having turned out a popular model which is light-weight and really sound and



well made. The "Standard-de-Luxe" is an 8×32 (effective aperture 30 mm.)—perhaps the most popular of all sizes, but hitherto rather heavy, particularly for ladies' use. The new model, however, weighs only 16½ ozs., and feels less, so comfortable is it to hold. A fresh—and important—feature is the provision of new-type eyepieces which bring the glass into line with the extra wide-

angle glasses, and cover 153 yards at 1,000. The price, with solid leather sling case and lanyard, is £9 15s. 0d.

NEW CODING SYSTEM FOR ILFORD BROMIDE PAPERS.

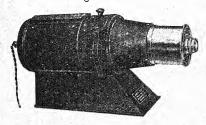
(Ilford Limited, Ilford, London.)

Messrs, Ilford Limited announce that with the object of facilitating ordering, eliminating errors and expediting handling and dispatch, they have put into operation a new system of coding. The code, which will appear on all boxes and packets of paper, clearly defines the kind, contrast, surface and thickness of paper, and it is hoped that those who order or write about Ilford bromide papers will make a practice of using the code.

THE ENSIGN HORIZONTAL MAGNAPRINT ENLARGER.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

At the low price of £2 17s. 6d. Ensign have produced this smaller model of their well-known horizontal Magnaprint enlarger especially for miniature negatives. The condenser diffused lighting principle



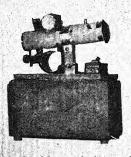
is retained, so that large prints can be obtained in the minimum of time from small negatives with the utmost freedom from faults due to surface defects on the negative. The enlarger is well made, small and handy—it is only 16 ins. long from the orange lens cap to the end of the switch

lampholder—and 9 ins. high. It has the same type of lamp housing, optical system and helical focussing adjustment as the vertical Midget Magnaprint, and it is fitted with an Ensar $f/6\cdot 3$ enlarging anastigmat. For those who like to work with a vertical easel it is a very practical instrument.

THE V.I.S. FILM-SLIDE PROJECTOR.

(Made by V.I.S. Projectors, 168A, Battersea Bridge Road, London, S.W. 11.)

Several improvements have been made in this projector since last year. The lamp housing has been completely isolated from the rest of the projector to prevent conduction of heat to the film,



and the main body of the instrument, comprising the pedestal, condenser mount and sprocket bearings, is now made in one piece in aluminium, thus reducing weight while increasing strength and rigidity. The sprocket wheel and gate are now mounted in front of the pedestal, thus allowing the gate to be reduced in size and improved in design, the lower film cup to be dispensed with and therefore film strips of any length to be handled without difficulty. The new model also permits of the direct projection of micro-slides. All types can now be

used with regulating resistance, battery or transformer, at will. With the standard 3 in. lens an 8 ft. picture is obtained at 24 ft., whilst lenses up to 5 ins. focus can also be supplied. Prices for the standard model 935 remain unchanged; a de luxe model, in chromium and aluminium, can be supplied at a slightly higher price. Thus type 3, with transformer, costs £6 5s. standard model; £7 de luxe.

SELO EXTRA FINE GRAIN MINIATURE CAMERA FILMS.

(Made by Ilford Limited, Ilford, London.)

Ilford Limited have long given close attention to the question of grain, and their films, each of its class, are noted for their fineness of grain. Not content with this, however, three new films have now been produced, especially to meet the needs of miniature These are: Selochrome Fine Grain Orthochromatic; camera users. Selo F.P. Extra Fine Grain Panchromatic and Selo H.P. Fine Grain Hypersensitive Panchromatic. The speeds (English calculators) are, respectively, 400, 500 and 1,000 H. & D., or 23°, 24° and 27° Scheiner, and prices, in patent 36-exposure Selo daylight loading cassette, 3s., 3s. 6d. and 3s. 6d. Boxes of six unspooled lengths, cut and numbered for dark-room loading, are supplied at prices of 10s. 6d., 12s. and 12s., respectively, and represent a considerable saving for those who are prepared to work in this way. Enlargements made from miniature negatives on these films up to 5 ft. in size prove conclusively the fineness of grain of the new emulsions, but it is not in this respect alone that the new films are specially adapted for this exacting work. Particular care has also been given to anti-scratch and anti-friction precautions, both in the film itself and in the cassettes which have been specially made for them. An interesting folder dealing with these films has been issued by Ilford Limited and should be in the hands of every miniature worker.

PRINTING AND FINE PHOTO-ENGRAVING.

(By Messrs. Hood & Co., Sanbride Works, Middlesbrough.)



From a collection of specimens which we have examined, the printing activities of Messrs. Hood would appear as limitless as their quality is high. A great part of the credit for the final result is due to the excellence of the blocks and other photo-mechanical work for which this firm is famous, but no less stress should be laid on the extremely high level of the work generally, both in conception and execution. From the simplest folder to the most elaborate catalogue or prospectus, and from a photogravure Christmas card, which is a Hood speciality, to exclusive stationery, these Hood products represent the very best in printing. Their excellent colour work in particular, and the striking yet restrained use of colour, is a great feature of their productions. Photographers who elect to entrust their block-making, or printing of whatever description, to Messrs. Hood can rest assured that the best possible job will be made of it.

IOHNSON'S LIQUID OPAQUE.

(Made by Johnson & Sons, Manufacturing Chemists, Ltd., Hendon, London, N.W.)

This opaque is a thick liquid for blocking out backgrounds, spotting out pin-holes or defects, or for the other purposes for which material of this type is required, such as working-in clouds on the glass side of a negative, etc. Testing it first for blocking out, we found it thoroughly efficient, a single application with an ordinary water-colour brush produced perfect opacity on a transparent part of a negative. It is easy to apply, as it "takes" on the gelatine surface smoothly without any repellent action, a trouble frequently encountered in blocking out. It is a sufficiently dense fluid to be applied easily to larger pin-holes with a finely pointed brush: for very fine holes it should be thinned with water and applied with a pen. It is a thoroughly efficient and satisfactory preparation.

THE KODAK FINISHER ENLARGER.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

The Photo-Finishing trade makes its own special demands in enlarging work; the growing use of miniature cameras in particular has created a fresh set of conditions to meet which an enlarger must



be more than ordinarily versatile. The Kodak Finisher Enlarger is more than ordinarily versatile. Two separate ranges of enlargement are obtained by the use of two lenses of different foci. The 6-in. f/4.5 Dallmeyer Enlarging Anastigmat gives 13-43 diameter enlargements or any reduction down to 3 diameters, from all negatives up to $6\frac{1}{2} \times 4\frac{3}{4}$ ins. The 3-in. lens gives a range of 41-11 diameters from negatives up to $2\frac{1}{2} \times 2\frac{1}{2}$ ins. The change-over from one lens to another is extremely simple to make. Lens apertures can be readily set in the dark as the stops "click" audibly into position at each setting. The carrier is designed so that either cut-up or strip film can be used. The strip guide is 21 ins. wide for miniature and 4 ins. wide for standard negatives. The Kodak Finisher Enlarger is of the vertical, automatic focussing type. Frictionless ball bearings and counterbalancing weights enable lamphouse and lens to be slid up and down with a smooth effortless movement. The enlarger requires no table, being mounted on an angle-iron framework; the feet are

provided with adjusting screws to take any irregularities in the floor. A 400-watt gas-filled Mazda Lamp is used, and even illumination is assured by a specially designed reflector and a sand-blasted diffusing glass placed between two heat-delaying plain glass plates. Adequate

ventilation is maintained by air which enters two perforated tubes situated below the diffusing glass, circulates upwards round the lamp-house, and passes out through the chimney. Exposures are made by means of a foot switch, thus leaving the hands free for shading and other control work. The over-all height of the instrument is 8 ft. 3 ins., and the price, complete with 400-watt lamp, plain paper board, foot-operated switch and two Dallmeyer lenses, is £65.

THE NEW SUPER IKONTA CAMERA.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

The 6×6 cm. Super Ikonta is the latest addition to this popular range. It is a de luxe miniature camera of unimpeachable finish, taking eleven $2\frac{1}{4} \times 2\frac{1}{4}$ in. pictures on an 8-exposure $3\frac{1}{4} \times 2\frac{1}{4}$ in.



spool. Its special features, apart from a precision of manufacture that is entirely unsurpassed, are rangefinder-coupled focusing, and a safety release which cannot operate twice on the same frame: winding on the film frees the release button. The release button is most conveniently situated on the body, and the whole camera is convenient to hold and quick and easy to operate. The lens is a Zeiss Tessar of f/2.8 or f/3.5 aperture, with front

cell focussing, and the shutter a delayed-action Compur speeded to 1/400 second. Shutter and stop setting are clearly visible from above, and a depth-of-focus scale is engraved around the distance scale pointer. An automatic film counter works on a dial indicator on the top of the body. In addition to the built-in optical viewfinder, a slide is provided on the body to take special finders. A feature which struck us very particularly is the exceedingly sweet, balanced self-erecting mechanism, which neither snaps out nor has to be pulled open. The price of the camera with $f/2 \cdot 8$ Tessar is £28 5s. and with $f/3 \cdot 5$ Tessar £25 5s.

SUPPLEMENTARY LENSES AND FILTERS FOR THE ROLLEIFLEX AND ROLLEICORD.

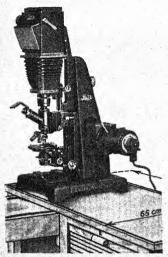
(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

When working close up with twin-lens reflex cameras, using supplementary Proxar lenses, it is necessary to compensate in some way for parallax. The Rolleipar is a prismatic disc which slips over the finder Proxar and automatically raises the screen image by the correct amount. Rolleipar I is supplied for Proxar Set 1, and Rolleipar II for Set II. For colour photography with Agfacolor, owners of these cameras may now also have the filters necessary for special work in the usual slip-over mount. These are filter No. 24 for artificial light and No. 30 for use under trees. An infra-red filter is also available and a green filter for panchromatic film. All are priced at 16s. except the green filter, which is 15s.

LEITZ APPARATUS FOR PHOTOMICROGRAPHY.

(Sold by E. Leitz (London), 20, Mortimer Street, London, W. 1.)

The Leitz Panphot is a universal microscope combined with a reflex camera which enables photographic work to be carried out under a very wide variety of conditions, from medical investiga-



tions with bright or dark-field illumination to mineralogical work with incident or transmitted polarised light. It can also be used for drawing. describe in detail the construction of the instrument, or the large variety of work that it can tackle is quite impossible in the space available, and we can only say that we were greatly impressed by a demonstration the instrument. To any technical photographer or photographic department having frequent and varied photomicrographic work to cope withsuch as would justify the first cost of the apparatus-from £160 upwards according to equipment — the apparatus should prove invaluable.

Another useful accessory is the Ring Illuminator for macrophotography, which consists of

a ring of 12 low-voltage lamps mounted in a housing around the objective and run off the mains. The light, diffused through opal glass, reaches the object from all sides, and sector diaphragms and reflectors of different types provide a very flexible system of illumination. The price of an equipment, complete in itself, but to which further accessories may be added as required, is £10 17s. 0d.

STAINLESS STEEL DEVELOPING RODS.

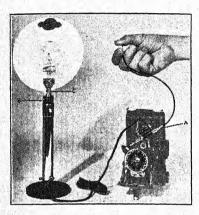
(Made by N. J. Bowyer-Lowe, 3, Commerce Lane, Letchworth, Herts.)

A range of stainless steel developing rods and weight rings of excellent quality and finish, and at very moderate prices, have been introduced by this firm. Straight rods are made in lengths from 12 to 25 ins., at 9s. to 14s. per dozen nett; single dipped rods, from 8 to 131 ins. (lower portion), at 6s. 8d. to 8s. 6d.; and weight rings, 23 or 31 ins., at 7s. 6d. and 8s. 6d. respectively. Those who have once used stainless steel D. & P. accessories will not readily return to other materials, and at these prices they should make a strong appeal. It is the intention of Messrs. Bowyer-Lowe to specialise in apparatus for the advanced amateur, and the D. & P. trade, and accessories such as the above will also be made to special sizes to order.

ENSIGN SYNCHROFLASH OUTFITS.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

The Synchrofiash is a complete, and inexpensive outfit utilising flash bulbs, synchronised with the camera shutter, for indoor home snapshots. It comprises the lamp standard, which serves also as



a battery case, battery, reflector, flex, four flash bulbs and the synchronising device. This device differs for different types of shutters, and the type has therefore to be specified when ordering an outfit. The reflector is six inches in diameter. and of good reflecting The metal parts power. are well plated, and the base is amply heavy enough to prevent the lamp from falling over. It is a very nicely up outfit. got thoroughly practical, simple to use and attractive in appearance. It is sent out with its lamps and accessories in a substantial cardboard box suitable for

storing the whole equipment when not in use. The price of the No. 5 outfit, for everset and roller-blind shutters, as illustrated, is £1 7s. 6d. A folder describing this and other new Ensign Home Lighting Equipment—the inexpensive Ensign Multiflood, with 12-in. reflector and universal wire stand for Osram Photoflood lamps, simple flash bulb outfits, and the powerful Ensign PhotoSpot, may be obtained from any dealer or direct from Ensign, Ltd.

THE ILFORD EXPOSURE METERS AND SELO SPEED CARD.

(Sold by Ilford Limited, Ilford, London, E.)

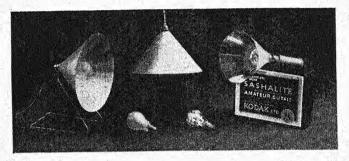
Users of the well known Imperial exposure meters and reckoner will now find them, under the name of Ilford, unchanged in principle or appearance, but carefully brought up to date and adjusted to give absolutely uniform and reliable results under all conditions. Those who use sensitive tint actinometers will find these meters—one for bright light and the other for dull light and interiors—most convenient and reliable. The price is 1s. 6d. for either meter or reckoner, or 3s. 6d. for the Duplex meter combining the two single meters.

Messrs. Ilford have also issued a Selo speed card, which gives the daylight speeds of all Selo films in Din, Scheiner, H. & D. (English and Continental), Weston, Burroughs Wellcome and Justaphot. All who use Selo films should secure a copy of this card.

KODAK NIGHT PHOTOGRAPHY AIDS.

(Made by Kodak Ltd., Kingsway, London, W.C. 2.)

An examination of the Kodak accessories for night photography for the 1935-36 season reveals a number of improvements and additions. The well-known "Kodaflector" reflector, for use with Photoflood lamps to enable full use to be made of their illumination. is now made of specially surfaced aluminium, and is carefully adjusted to give a diffused beam of maximum illuminating efficiency. and the surface is protected by a hard, but elastic, lacquer that will not discolour under heat. Two outfits are supplied for use with



Kodaflectors-one comprising a wire frame device for standing or hanging the reflector from any convenient support, with flex, lampholder, etc., and the other a two-unit floor stand which will be useful to ciné as well as still workers. The recent reduction in the price of Photoflood bulbs from 4s. to 2s. 6d. should prove an additional inducement to make every possible use of them. An interesting folder has been issued by Messrs. Kodak on night photography for the amateur in which full details and prices of the whole range of accessories will be found.

ZEISS INFRA-RED FILTERS.

(Sold by Carl Zeiss (London), Ltd., Mortimer House, Mortimer Street, London, W.1.)

For any systematic work in the infra-red it is essential to use filters which can be relied upon to transmit a definite range of spectral radiation. A range of such filters has been placed on the market by Carl Zeiss. These are of glass coloured in the bulk as distinct from "flashed" glass or gelatine film, and can therefore be relied upon to remain absolutely constant in transmission. Four ranges are covered: filter RG1, transmitting from about 600 mu; RG2, from 625 mu; RG5 from 675 mu; and RG8 from 700 mu. For complete elimination of the visible radiation the filters must be combined with the Zeiss filter BG3. Further details of the filters and of their transmission in the infra-red can be obtained from Carl Zeiss (London), Ltd.

THE PERKINO DEVELOPING TANK.

(Sold by Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)
This is a very well-made tank for miniature films (35 mm. ciné

film) constructed entirely of bakelite. It is easy to clean, and there is no apron nor any loose parts, and it is a very easy tank to load in complete darkness. All operations including final washing can be carried out in the tank, and a stirring rod is provided to ensure even development and fixation; the tank holds 18 ounces of solution. The Perkino is excellent value at 25s. 0d.

THE TROFI RANGEFINDER.

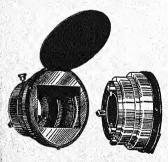
(Sold by R. E. Schneider, 189, The Grove, London, W. 6.)

This handy little instrument is designed for attachment to the tripod bush of a hand camera. It has a slide attachment which is screwed into the bush, after which the rangefinder can be slipped in and out in an instant. It is a nicely finished little instrument, easy to use, accurate reading and is scaled down to 3 ft. Attached to a folding camera with scale or front lens focussing, it ensures absolutely sharp negatives and saves all guessing. The price is £1 Is. 0d.

THE ZODEL LENS HOOD.

(Made by Wallace Heaton, Ltd., 119, New Bond Street, London, W. 1.)

The Zodel lens hood solves the problem of an efficient lens hood in a small space. It is made in three sections which telescope to a size convenient for the pocket or camera case, but which are



perfectly firm when extended. Owing to the design of the hood there is no danger of the dead black lining rubbing off in use. A sky-shade flap and rectangular mask at the front aperture can be turned at any angle relative to the camera and each other. Two sizes are made—one for lens cells from 1 to 11 in., and the other from 11 to 2 ins. diameter. Filter holders, turned from solid metal, and interchangeable in both sizes of hood, are supplied to take any standard unmounted filter from 11 to 11 in. diameter

and $\frac{1}{15}$ to $\frac{3}{16}$ -in. thick. The price of the hood, either size, is 7s. 6d., and of the filter ring 2s, 0d.

THE EXAKTA MODEL B FOCAL PLANE MINIATURE REFLEX CAMERA.

(Sold by Garner & Jones, Ltd., Polebrook House, Golden Square, London, W. 1.)

The Exakta camera for $6 \times 4\frac{1}{2}$ cm. rollfilm is already well known for its extreme compactness and by the versatility of its reflex finder and its shutter. By an ingenious arrangement utilising a mirror



the focussing screen can be viewed either from above or at eye level, whilst a straight through eye-level finder is also provided. A magnifier springs automatically into position in the hood. In this model the shutter has been still further improved and now gives time, bulb and instantaneous exposures from 1/1000 to 1/25 second and 1/10 to 6 and 12 seconds, all of which, with the

exception of the last-12 seconds-can be used in conjunction with a delayed action mechanism. The shutter and film are wound together, rendering double exposures impossible. The price of the camera with Zeiss Tessar f/2.8, 7.5 cm. focus, is £27 10s., and it may be had also with various lenses from the f/3.5 Exactar anastigmat at £19 10s. to the Dallmeyer f/1.9 Super Six at £36 and the Zeiss Biotar f/2 at £47 10s. A number of telephoto and wide angle lenses can be supplied and used interchangeably. They can, of course, be changed with the camera loaded, as the focal plane shutter protects the film.

ENLARGING ANASTIGMATS.

(Made by J. H. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

It is not as generally realised as it might be that for enlarging, a lens must be differently corrected both as regards spherical



aberration and colour from a camera lens. Messrs. Dallmeyer, who have given much attention to this problem, supply a series of enlarging lenses which can be relied upon to give the utmost perfection of definition at their full aperture of $f/4 \cdot 5$. This is particularly important in enlarging from miniature negatives. A new popular series

of $f/4\cdot 5$ enlarging lenses has also recently been brought out in focal lengths from 3-in. to 7-in., at prices from £3 10s. 0d., in response to the demand for a good quality anastigmat for use on horizontal and vertical enlargers,

selling at a low price.

ILFORD X-RAY ACCESSORIES.

(Made by Ilford Limited, Ilford, London.)

Two useful accessories for the Radiologist have been placed on the market by Ilford. One is the dark room film container, which is an all-metal service cabinet designed for the storage of X-ray



film in the dark room. The separate compartment for the different sized films are easily accessible, and the cabinet is so constructed that it cannot be left open. cabinet takes two dozen films, each of five sizes from 15×12 to half-plate. The price if £2 5s. 0d. The other accessory is a dental viewing lantern in which 14 films of a full mouth can be viewed simultaneously, whilst masks are provided to accommodate one, two, three and ten

film size mounts with no surrounding white light. The price is £1 17s. 6d.

ACCESSORIES FOR THE CONTAX CAMERA.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

One of the numerous accessories made to fit the slide of the Contax—and Super Nettel—cameras is the Contameter. This extends the principle of rangefinder focussing to objects too near



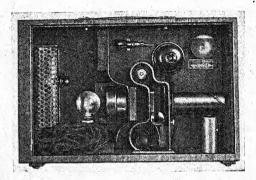
the camera for the builtin rangefinder to function. It is used in conjunction with three Proxar attachment lenses, and enables close-ups to be taken, with needle sharp accuracy of focus, at distances of 20, 12 and 8 ins. The price, complete with the lenses, in case, is £10 5s. A whole range of special finders fit the same slide. A universal eye-level finder, giving erect, unreversed images, covers all focal lengths down to

2 ins., and there are special finders for shorter focus lenses. The Albada finder is on a new principle, and gives a very wide field with the correct frame clearly marked out by a white rectangle. Other finders are for waist level and oblique use: there is, in fact, a finder for every possible lens and purpose.

UNIVERSAL LONG-RANGE PORTABLE FILM-SLIDE PROTECTOR.

(Made by Newton & Co., Ltd., 43, Museum Street, London, W.C. 1.)

In producing this film-slide projector, Messrs. Newton had in mind the need for apparatus of the utmost simplicity requiring no technical knowledge whatever to operate. In type B1, illustrated,



 the resistance is housed in the carrying case. and is simply pulled out on its baseboard when in use. An all-in portable model also made which will accommodate the resistance or an accumulator in a separate compartment neath the projector, whilst a third, simple

model for classroom or home use, is reduced to the simplest possible form, without carrying case or resistance, for use on any 6-volt battery. In all, the projector itself is identical-simple, robust and well designed; safe from overheating, easy to operate and giving excellent definition and a brilliant screen picture. Extra brilliance and increased size of picture are secured by the use of 1 × 1 in, film-slide frames as against the more commonly used 1 x 3 in. The price of the model shown, for use on any electricity supply from 100-260 volts, is £8 8s.

VOIGTLANDER "BESSAPAN" FILM.

(Sold by Schering, Ltd. (Voigtländer Dept.), 188/192, High Holborn, London, W.C.1.)

Yet another addition to the growing family of panchromatic "twins" is this new Voigtländer pair—Bessapan ultra-sensitive and Bessapan F fine grain. We have had an opportunity of testing a $3\frac{1}{4} \times 2\frac{1}{4}$ rollfilm of the former variety, rated at $19/10^{\circ}$ Din, and find its speed and fineness of grain to compare well with other films of its class. Latitude is good, as is to be expected from a double-coated film, and it has an effective anti-halation backing which disappears in the fixer. Particular stress is laid by the makers on colour sensitivity throughout the spectrum, and tests show that the red sensitivity is high, but not excessive, and the yellow and green particularly good. A light yellow filter gives almost perfect correction in daylight, and good correction is obtained in half-watt light without a filter. A protecting cover for the red window is supplied in every carton.

THE ILFORD PHOTOELECTRIC EXPOSURE METER.

(Sold by Ilford Limited, Ilford, London, E.)

This is a really British meter—made in England by a leading firm of electrical measuring instrument manufacturers in collaboration with Messrs. Ilford, and scaled in terms of British materials: Ilford



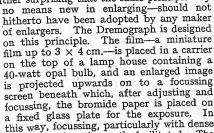
plates and films. It is a handy little pocket instrument, in a neat leather ever-ready case. Operation is simplicity itself. A disc is turned once and for all to the speed of the plate or film—these are divided into groups; no speed numbers are used-the meter is pointed at the subject and a second disc turned to the desired stop, when the pointer will indicate the required exposure direct. In addition to its use with ordinary materials, the meter has been specially calibrated for use with Dufaycolor rollfilm, flat film and 16 mm, ciné film, thus ensuring the maximum possible accuracy in exposure with this material. All Dufaycolor workers should possess one.

double cell is deep set, and therefore includes only the actual camera angle. The price of this handy little meter, which it is safe to say, from the reputation of the makers, is robust and reliable, as well as extremely sensitive, is £3 3s. 0d.

THE DREMOGRAPH ENLARGER.

(Sold by Drem Products, Ltd., 37, Bedford Street, London, W.C. 2.)

In view of the universal use of the transilluminated screen throughout photography it is rather surprising that the same principle—by



negatives, is greatly facilitated. The enlarger is supplied either without a lens for use with the Leica or Contax camera lens, or a separate $f/4 \cdot 5$ anastigmat can be purchased with it for an additional 35s. 0d. The price of the enlarger without lens is £6.

THE MENTORETT 6 \times 6 cm. AUTOMATIC ROLL-FILM REFLEX.

(Sold by A. O. Roth, 85, Ringstead Road, Catford, London, S.E.6.)



This addition to the ranks of the twinlens miniature camera-a product of the Mentor factory of Dresden-incorporates several important new features. It has a special focal-plane shutter which is exceedingly smooth in action, and gives a full range of speeds up to 1/600 sec. A single movement of a lever winds on the film. sets and releases the shutter, is always ready for exposure, and operates a counter. Double exposure is of course impossible. Another very important feature is the coupling of the diaphragms of the taking and reflex objectives and the situation] of the diaphragm scale on top next the hood, so that the effect of varying the actual taking aperture can be watched on the reflex screen. Minor refinements are an automatic closing 21 X magnifier in the hood and an efficient hinged safety window cover. The whole camera is very substantially constructed, the body being a solid casting in light alloy, and is well finished. The price, with f/3.5 anastigmat, is £21.

SELO LIGHTING SET FOR INDOOR PHOTOGRAPHY. (Made by Ilford Ltd., Ilford, London, B.)



The Selo Lighting Set comprises all the equipment necessary for indoor home portraiture by artificial light. It is superior design and of especially strong manufacture. The reflector is of spun aluminium and can be adapted for use with any existing light socket, whilst the stand is a solid metal casting. Both lamp and reflector can be adjusted to any angle. The outfit includes 3 yds. of twin flex, B.C. bakelite plug adapter and Photoflood lamp.

price is 17s. 6d. from any photographic dealer.

THE K.W. EPISCOPE FOR PROJECTING MINIATURE PRINTS.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

An Episcope which, at a very low price, will give an enlarged screen picture, up to fully 2 ft. square, of miniature prints or other small black-and-white or coloured pictures or diagrams is something

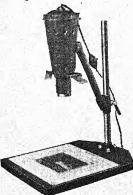


of an achievement, and certainly fills a definite This instrument takes any size print up to $3\frac{1}{2} \times 3\frac{1}{2}$ in., and is provided with a slide similar to a lantern-slide-changer, with carriers for all standard sizes down to Leica. It is fitted with a 5.3 in. f/3.2projection lens which, with the 100-watt lamp, gives a screen picture of ample The weight of brilliance. the whole projector is only 41 lbs., and its overall dimensions are 7½ X \times 9½ ins.

THE ENSIGN MIDGET MAGNAPRINT ENLARGERS.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

This smallest edition of the well-known Magnaprint enlargers is designed to take any miniature negative, and owing to the very is designed to take any miniature negative, and owing to the very indicate illuminating system enables



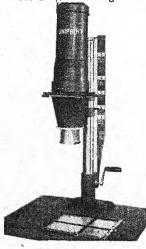
efficient illuminating system enables prints up to 15 x 12 to be made with the minimum of exposure. The use of a condenser ensures maximum illumination, whilst the opal bulb gives the diffusion which is desirable when enlarging from miniature negatives. Three models are made. One has an Ensar f/6.3 anastigmat, and costs £4 10s. 0d.; a similar model at the same price has no lens but an adapter front to take interchangeable Leica lenses, and a special carrier for 35 mm. film. The third model, costing £6 17s. 6d., has a Dallmeyer f/4.5 enlarging anastigmat. All three models have the same smooth slide motion with quick locking lever, giving maximum ease of adjust-

ment. Focussing is by a helical motion which can be locked in any position.

THE UNIPRINT ENLARGERS.

(Made by Fritz Weist, Stockholm; sold by Actina, Ltd., 29, Red Lion Square, High Holborn, London, W.C. 1.)

The Uniprint 34 enlarger is the outcome of many years' experience in the design of enlargers for professional use. It is a 9×12 cm.



enlarger designed for working and hard and continuous The lenses are fitted in a bayonet mount and are easily interchanged. The new model has an improved scale which reduces to a few seconds the time of setting to particular magnification. negative carrier, which will take any negative from 9 × 12 down to Leica size, is fitted with a steel rule masking device which excludes extraneous light from the easel. Messrs. Weist also make a 13 × 18 cm., especially suitable for industrial and portrait work and Polyfoto enlargements, whilst a smaller, 6×6 and 6×9 enlarger of simpler design, but with an excellent f/4.5 lens and double condenser, is made for amateur Prices are as follows: 9 x 12 (as illustrated) £17 17s.; 13×18 £42; 6×9 £8 15s.

THE RODENSTOCK CLAROVID II CAMERA.

(Sold by F. G. Phillips, Ltd., 44, Farringdon Street, London, E.C. 4.)

This is a well made and excellently finished camera which takes eight or 16 pictures on a $3\frac{1}{4} \times 2\frac{1}{4}$ in. spool, by means of a removable mask, and has one very outstanding feature. This is the range-



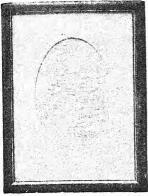
finder, which we should judge gives the camera its name, for not only does the rangefinder field act simultaneously as a full-view view-finder, with a brilliant image even under extremely dull conditions, with an exceptionally clearly marked boundary, but the coincidence adjustment, which is made between the main field and a central rectangle, is the easiest we have met, because of the brilliant image and sharply defined coincidence boundaries. It is impossible to "lose" the second image, even in dim interiors. Loading is on the convenient swing-out cradle

system, and a positive internal red window shutter is provided. The price of the camera, with Trinar $f/4\cdot 5$ anastigmat, in D.A. Compur shutter, is £15 10s., or with Trinar $f/3\cdot 9$, £16 7s. 6d. The Compur Rapid shutter can be supplied at an extra cost of £1 8s. 6d.

FRAMES AND FRAMING MATERIALS, ARTISTIC NOVELTIES.

(Sold by Bennett & Jennison, Ltd., Ladysmith Road, Grimsby.)

All who are interested in frames and framing materials should endeavour to call at the new and larger showrooms which have been opened by Messrs. Bennett & Jennison, Ltd., at 67, Aldersgate

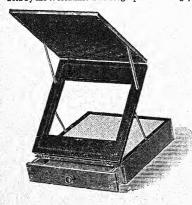


Street, London, E.C. 3, opposite the Manchester Hotel, where they will find displayed not only a large selection of new mouldings and photo frames, in burnished silver and gilt, with polychrome colours such as blue. orange, jade, ivory, etc., but also hundreds of artistic novelties in hand painted Barbola ware, such book-ends. candlesticks. plaques, screens, mirrors, etc. Any photographer wishing to equip his own frame making department will find here all the necessary tools and accessories to enable him to do so at a moderate outlay. To those who are unable to call and see these

products for themselves, lists and samples of mouldings will be sent on receipt of trade card.

THE WESTMINSTER UNIVERSAL RETOUCHING DESK.

Sold by the Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)



This is a very serviceable London made desk, well finished in polished mahogany. It has an opal reflector, and variable angle desk. One reversible carrier is supplied with the desk, to take 1/1 plates, and smaller carriers can be purchased at prices from 1s. 3d. to 2s. to take any standard size plate down to V.P. A large drawer beneath the opal glass provides accommodation for retouching implements and materials. The desk folds into small space when not in use. The price is 25s. 0d.

THE ZEISS LONG-FOCUS TRIPLET.

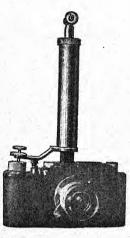
(Sold by Carl Zeiss (London), Ltd., Mortimer House, Mortimer Street, London, W.1.)

This long focus objective has been designed for long distance and special work on exceptionally large cameras. Owing to its large relative aperture—f/7 on a focal length of 47 ins.—it is useful both for special press purposes and for aerial photography. The over-all diameter of the lens is $15\frac{1}{4}$ in. and the front cell diameter 8 ins. It is equipped with an iris diaphragm and requires a camera extension of 46 ins.

THE ARKA PHOTOFLASH SYNCHRONISER.

(Sold by R. E. Schneider, 189, The Grove, London, W. 6.)

Synchronisers, to be of any use, must be absolutely reliable, and



preferably simple. The Arka is both simple and, judging from our tests. It has also the advantage of reliable. being very reasonable in price. models are made, Model I for the Leica. working direct on to the release, and Model II to screw into the tripod bush on folding cameras with Compur or similar shutters which have a wire In each case the synchronising adjustment is very simply effected with the aid of a pocket flash lamp bulb. The illustration shows a Leica camera with the Model I synchroniser attached. but with the reflector removed. Synchronisation is here effected by adjusting the milled head, seen on the left-hand of the illustration, until the shutter opens just before the flash is fired. The synchroniser is elegantly finished and costs 27s. 6d., either model: aluminium reflector, 6s. 6d. extra, or folding paper reflector 1s.

SUPRAMIN SUPERFINE-GRAIN DEVELOPER.

(Sold by L. A. Leigh, Balfour House, Finsbury Pavement, London, E.C. 2.)

This latest addition to the well-known Fesagol series of developers is a paraphenylene-diamine developer, and is claimed to be not only the finest grain developer on the market, but to be non-staining and non-injurious, and to require no increase upon the normal exposure. These latter features are claimed to be unique properties of this as compared with other developers containing paraphenylene-diamine. As to its fine grain properties, tests show that even the most ultra-sensitive panchromatic emulsions are developable with Supramin without grain becoming objectionable even on considerable enlargement, and that even prolonged development is without serious effect in this direction.

THE PRINSEN PHOTOELECTRIC EXPOSURE METER.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

This is a simple, handy and reliable meter for still or ciné cameras, reading on a new principle. As a rule, the pointer of a meter *points* to a figure which, directly or indirectly, indicates the exposure. In

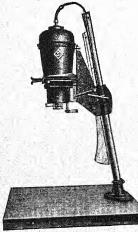


the Prinsen meter, the stop values, from $f/1 \cdot 4$ to f/16, are marked along the length of the pointer, which travels over a set of curved red and black "channels." Reading consists merely in following to its end the channel on which the chosen stop value has come to rest, when the exposure is read straight off, the meter having previously been set for (English) H. & D. speed by turning a milled head. The meter is well made, attractively finished, small and light. It has a lens window which effectively restricts the field to approximately that of the camera The price, with a very angle. full instruction booklet, is £3 3s., ever-ready case 5s. extra.

THE PRAXIDOS ENLARGERS.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

It should be sufficient recommendation of the Praxidos enlargers that they have been adopted, after careful tests of all models



available, by some of the largest photo finishers in this country. Two models are made, automatic, as illustrated, and non-automatic, and three sizes of each model-4 x 4, 6×6 and 6×9 cm. A feature of both models is the one-hand vertical adjustment and the versatility of the illumination-projection or opal lamp, opal diffuser and single or double condenser—the interchange being made in one movement. The automatic models have f/3.5 special enlarging anastigmat lenses, the non-automatic f/4.5. The automatic models have an indicator for degree of enlargement. examination of these instruments fully justifies the makers' claim that they can be relied upon for accuracy and hard wear.

NEW DALLMEYER TELEPHOTO LENSES.

(Made by J. H. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

Leica owners who would prefer a telephoto lens of rather shorter focal length than the well-known Dallmeyer 12-in. are now offered the choice of two Dallmeyer f/5.6 lenses—a 6-in. at £10 10s. and a 9-in. at £15 10s. The 21×21 Korelle reflex camera, also, can now be equipped with a Dallmeyer 6-in. Dallon Tele-Anastigmat for interchangeable use. The price of this lens is £8 10s. Messrs. Dallmeyer now manufacture so large a variety of lenses, of such excellent quality, that intending telephoto users can safely consult them with every expectation that their requirements will be met without difficulty.

THE NETTAR $3\frac{1}{4} \times 2\frac{1}{4}$ in. F/3.5 FOLDING CAMERA.

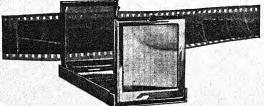
(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

This camera can justly claim to be quite remarkable value. At the price of £9 10s. it offers an f/3.5anastigmat lens in Compur shutter with delayed action, and speeded to 1/400 second. It has a self-erecting front and view-finder, one touch of a button bringing the whole camera into action. As with all Zeiss Ikon cameras, the self-erecting mechanism is very sweet in action. Focussing is by a very heavily milled front cell rotation, with good, clear engraving visible from above. Film changing is convenient, and there is nothing to get out of order. Altogether the f/3.5 Nettar is a camera to appeal to the amateur seeking a wide aperture folding film camera.

THE "RHACO" MINIATURE FILM TESTER.

(Sold by Garner & Jones, Ltd., Polebrook House, Golden Square, London, W. 1.)

This little pocket folding magnifier stand should be invaluable to miniature workers. It magnifies 2-2½ x, and is fitted with a matt celluloid diffusing sheet of 4 x 4 cm. clear aperture, giving



even illumination over the film, which is slipped behind spring guides that keep it flat against the diffusing sheet.

magnifier is a large, square double convex lens, and can be used as effectively for prints as for negatives. The price is 10s.

THE ARISTOSTIGMAT 105° F/6·3 WIDE-ANGLE LENS FOR COMPUR SHUTTERS.

(Sold by A. O. Roth, 85, Ringstead Road, Catford, London, S.E. 6.)

As a general rule it is not possible for owners of cameras with Compur shutters to replace their standard lens by a wide angle lens for architecture, indoor work, banquets, etc. The new Aristostigmat



is supplied not only in a standard mount with flange, but also in interchangeable lens cells adjusted to the screw threads and separation of the appropriate Compur shutters, so that by the simple expedient of changing over the lenses a wide-angle lens becomes available in place of the standard lens.

The Aristostigmat is supplied in focal lengths from 31 to 101 ins.

SHOWCARDS FOR THE PHOTOGRAPHIC TRADE.

(Made by Qix Publicity, Garsides Buildings, Park Road, Ormskirk.)

Enterprising businesses will welcome the showcard and window ticket service introduced by Qix Publicity, of Ormskirk. These embossed showcards are of strikingly modern and original appearance, indicative of specialised experience and careful workmanship, and are certainly far superior to written and printed cards; unless very large quantities are required, they are also much cheaper, even when in several colours. They are made in any ordinary size and shape (either rectangular or cut-out), and in any design and combination of colours, whilst space can be embodied in the design for mounting specimen photographs, if desired. Prices range from a few pence upwards, and particulars, prices and specimens will be sent post free by Qix Publicity on request.

THE SOHO "DAINTY" PRISMATIC BINOCULAR.

(Sold by Soho, Ltd., 3, Soho Square, London, W. 1.)

An attractive new product of Messrs. Soho, Ltd., is the new "Dainty" $4\frac{1}{2}\times$ prismatic binocular, manufactured by their associated company, Messrs. Kershaw, of Leeds. Kershaw



binoculars are well known for high performance and excellent finish, and this new model meets the demand for a compact glass of moderate magnification and wide angle, suitable for the theatre, as well as for travel and sport, at a price well within the reach of those of average means. The new glass is provided with every refinement to be found on a modern prism binocular—adjustable inter-

ocular distance, central focussing, and separately adjustable right-hand eyepiece—and the construction is dustproof and durable. The glass is supplied complete in black Morocco case. Price £4 10s.

THE CORREX DEVELOPING TANK.

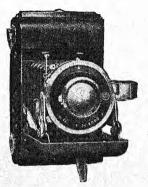
(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

This well-known tank has now been improved by the addition of an agitator to ensure even action of the developer, by occasionally revolving the film during development, thus removing any air bubbles that may have been present in the developing solution. The price is 25s. 0d. for V.P. and $3\frac{1}{4} \times 2\frac{1}{4}$ in. and 30s. 0d. for $2\frac{1}{2} \times 4\frac{1}{4}$ in. films.

THE NORFOLK MINIATURE CAMERA.

(Sold by the Sheffield Photo Co., Ltd., Norfolk Row, Fargate, Sheffield.)

Bakelite, the handmaid of radio, is as yet hardly known to photography. The new Norfolk miniature camera, however, taking 16 pictures on a $3\frac{1}{4} \times 2\frac{1}{4}$ in. spool, is made of "unbreakable"



We have not gone to Bakelite. the length of experimenting, but we have reason to believe that this material really is extremely tough. It is, moreover, very light, and smooth and pleasant to the touch. and, in winter, warm, as compared with metal bodies. The Norfolk has a very rigid self-erecting front. the optical viewfinder opening simultaneously with the camera, The very convenient press-down release we found more comfortable in use than the ordinary trigger of the Compur. Loading is convenient; the case opens easily and the spool holders have a parallel spring motion that makes for easy chang-

ing. The red windows have a positive action internal shutter. The price of the camera with Schneider Radionar $f/2\cdot 9$ lens with front cell focussing, clearly seen from above, and Compur Rapid D.A. shutter speeded to 1/400 second, is £7 19s. 6d. It can also be had with Steinheil $f/3\cdot 8$ Cassar at the same price.

THE ILFORD MANUAL OF PHOTOGRAPHY. NEW EDITION.

(Published by Ilford Limited, Ilford; and Henry Greenwood & Co., Ltd., 24, Wellington Street, London, W.C. 2.)

It is forty-five years since the first Ilford Manual was published, and during the years that have passed successive revisions have been made as new editions were printed. The present edition, however, is an entirely new book, practically rewritten throughout by a staff of experts working under the editorship of the late George E. Brown, F.I.C., Hon. F.R.P.S., for thirty years editor of the "British Journal of Photography" and the "British Journal Photographic Almanac."

The Ilford Manual is, unquestionably, one of the best, if not the

best, elementary book on photography. Although it commences at the earliest stages, and gives elementary instruction that any beginner could follow and find useful in learning the elements of his work, it takes him far beyond the elementary stage and progresses steadily to work of an advanced character. It is very clearly written throughout: all the explanations are lucidly expressed and fully illustrated wherever necessary by numerous line diagrams and views of pieces of apparatus and about twenty-five fine photogravure plates.

No photographer will wish to be without this valuable book of reference, as it contains all the information and data which he will require in his ordinary practice. It is strongly bound in waterproof

cloth, and forms a really valuable book of reference.

The price of the book is 2s., postage 6d.

THE SUPERPLEX DAYLIGHT DEVELOPING TANK.

(Sold by Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)

The Superplex is a de luxe tank capable of being loaded and operated throughout in daylight. It is claimed to be the only daylight loading tank which will take all sizes of rollfilms from



V.P. up to $2\frac{1}{2} \times 4\frac{1}{4}$ in., including 3×2 in. and 620 spools. It is of bakelite throughout, and is so constructed that as the covering paper is drawn away from outside and the spool unwinds, the film threads itself on to the spiral. A thermometer can be inserted in the filling funnel, and a stirring rod is provided. All operations can be carried out in the tank, but it is recommended that for final washing the films be transferred to another vessel. The quantity of developer used varies from 14 oz. for

V.P. films to 19 oz. for $2\frac{1}{2} \times 4\frac{1}{2}$ in. The price of the tank is 45s. 0d.

ILFORD COLOUR FILTERS AND ADJUSTABLE HOLDERS.

(Made by Ilford Limited, Ilford, London.)

A comprehensive booklet has been issued by Messrs. Ilford Limited in which are described in detail all the Ilford filters most commonly in use—filters for landscape and general work for photo-micrography, three-colour work and scientific work, and a special series for use with orthochromatic materials and specially intended for the Selochrome type of emulsion. Many years experience in the manufacture of colour sensitive materials have placed Messrs. Ilford in a position perhaps second to none in regard to filter technique and those who are interested in colour rendering of any description—and what photographer is not?—should obtain a copy of this booklet, which gives particulars not only of the filters themselves, but of the Ilford adjustable filter holders in which they are very conveniently used.

THE PLANOVISTA PRIMA CAMERA.

(Sold by Seeing Camera, Ltd., Central House, Upper Woburn Place, London, W.C. 1.)

The Planovista Prima has all the advantages of a reflex camera without its bulk and weight. It is a twin-lens camera, taking V.P. size pictures, the upper lens forming an image direct on to a



focussing screen, instead of via a mirror. It is thus a "direct vision" camera. The focussing screw simultaneously corrects for parallax for all distances, and the shape of the camera and position of the carrying strap are ingeniously contrived so that the camera can be securely and comfortably held, and the release operated, with the right hand, leaving the left free for focussing. Despite the slimness of the camera—1½ ins. thick only—there is space inside the body of the camera for two spare films. Well known makes of wide aperture

lenses—Zeiss, Meyer, etc.—from f/3.5 to f/2.7 are fitted, with Compur shutter, and prices range from £8 19s. 0d. upwards.

RAINES PHOTOGRAPHIC SERVICES.

(Raines & Co. (Ealing), Ltd., Ealing, London, W. 5.)

Owing to the increased popularity of miniature cameras, Messrs. Raines have installed the most up-to-date equipment for processing miniature films, and have an experienced staff exclusively engaged on this work. The company has been engaged for over 40 years in the production of photographic prints and enlargements for the professional, amateur and commercial photographer. The staff numbers nearly 100, and each department is under the control of a specialist. Other activities include the poduction of photographic murals, backgrounds for cinema studios, transparencies and lantern slides, cut-outs, mounting and framing. It is interesting to note that all the coloured enlargements at the recent Daily Express War Photographs Exhibition, comprising some of the largest individual enlargements ever produced, were Raines products.

THE A.R.C. ANTI-CLIMATIC WATER CONNECTOR.

(Made by the Altrincham Rubber Co., Kingsway, Altrincham.)

A really reliable and durable washer connector will be universally welcome to every class of photographer. This connector is claimed



grapher. In sconnector is claimed to be anti-climatic, and has reinforced ends ensuring lasting service. It is 24 in. long; one end fitting a \{\frac{3}{2}\) in. washer inlet. The other end fits a \{\frac{1}{2}\) in. or \{\frac{3}{2}\) in. tap, the prices being 2s. 6d. and 3s. 0d. respectively. The connector fits easily over the tap, and the re-inforcing provides a firm grip.

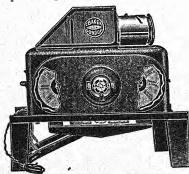
(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

This new colour film, packed in the now familiar "patrone" for the Leica, Contax and other cameras, opens up a new field for snapshot colour photography with these cameras. The small size of the picture and the fact that eighteen exposures only cost 6s. (processing 1s. 6d. extra) cheapens what has previously been an expensive side of photography. The film is of the reversal type, and the resulting little pictures can be compared to miniatures in their delicacy of colouring and amazing wealth of detail-at a magnification of two or three diameters they reveal still more of their beauty. The film is extremely simple to use as it is loaded into the camera in the ordinary way-the processing being carried out by the manufacturers. The material has a fair latitude, but exposures have to be fairly carefully made in order to preserve the original colour of the subject. Even with this limitation, both under- and over-exposures have not been entirely worthless. There should be no difficulty in projecting individual exposures in the form of lantern-slides as projectors are available with condensers in the form of water-cells, to avoid over-heating the film.

THE BAKER EPIDIASCOPE.

(Made by Charles Baker, 244, High Holborn, London, W.C. 1.)

The Baker Epidiascope, already well known in educational quarters, has recently been still further improved in several important particulars; incidentally, the only two components



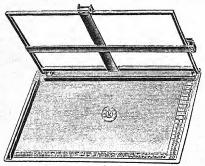
that were formerly of foreign manufacture—the motor and lamps-are now The chief im-British. provement lies in making the whole fan and motor unit removable and interchangeable by removing two screws. Hitherto these were housed permanently within the casing. The fan bearings, also, are now of a special "frictionless" type requiring no oiling—an obvious advantage. projection lens has been re-computed and improved,

and last, but not least, a mobile undercarriage has been produced on which the whole Epidiascope may be placed and run around, on the smoothest of ball-bearing castors, enabling, say, a large map to be explored from corner to corner. Among other advantages this is, perhaps, the coolest-running Epidiascope made, and is therefore an instrument par excellence for biological work. The price is £36.

THE KINDERMANN MASKING FRAME.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

This new addition to the well-known Kindermann range of photographic accessories has been designed with a careful eye to practical needs. It is lightly, but strongly made, of metal through-



out, the frame being of square section metal on which slide easily two broad paper-holding masking strips of thin German silver. The frame itself forms the mask for the other two sides, and close graduations in inch measure are provided for setting the masks to the paper size. For inserting the paper the whole frame swings up on pivots and remains open of its own accord. The sheet metal

base has a good matt white surface which is excellent for focussing The frame is made in a range of standard sizes, prices ranging from £1 1s. 0d. for $\frac{1}{2}$ -plate to £3 for 15×12 .

KODALINE WET STRIPPING FILM.

(Made by Kodak Ltd., Kingsway, London, W.C. 2.)

Kodaline wet stripping film is a fine-grain orthochromatic emulsion. coated on paper, which constitutes an efficient substitute for wet collodion, to which it is similar in speed, for either line or half-tone work down to the finest screen. The advantages of this material over wet collodion will be obvious, both as regards darkroom procedure, speed of working, and general convenience, and in eliminating the use of potassium cyanide. Normal development in an M.O.-or for maximum contrast Hydroquinone-developer yields a result clean to the finest detail, and of ample density: the gamma of the material is extremely high. An acetic acid stop bath, and acid hardening fixer, is recommended, and the resulting film, when stripped from its paper base by simple immersion for two or three minutes in water at 80° F. is of great strength, and is easily and safely handled. To all intents and purposes it is non-stretch, and for all but the most exacting work stretch can be ignored. Transference to the final film or glass support is accomplished with an ordinary squeegee, and there is no difficulty whatever in removing the film from its final support, if required, by subsequent application of a damp paper for a few minutes. Kodaline stripping film is put up in all sizes up to 60-in. × 40-in., in packets of 12 sheets, and in 10-ft. and 25-ft. rolls, 12-in., 25-in., or 40-in. wide. As an indication of its cost, the price of a packet of 12 sheets, 12-in. × 10-in., is £1.

THE BARNET RAPID PANCHROMATIC PLATE— EXTRA GREEN SENSITIVE.

(Made by Elliott & Sons, Ltd., Barnet, Herts.)

This plate has been specially prepared to shorten the rather long exposures usually required for the green filter negative or red printer. Practical tests show that this aim has been achieved, the plate showing considerable advantage under screen negative making conditions, as regards speed, over a standard brand of panchromatic process plate, whilst a spectrum test showed their green record to be strictly comparable with that of the standard plate. The dot formation was quite satisfactory, with absence of scatter between the dots. The plate is clean working and free from fog, and should be a valuable addition to the materials at the disposal of the process worker.

HELIOPLAN ENLARGING ANASTIGMATS.

(Sold by A. O. Roth, 85, Ringstead Road, Catford, London, S.E. 6.)

In computing this series of f/4.5 lenses for enlargers, special consideration has been given to light transmission, even illumination, uniformly perfect definition over the whole field, colour correction



and the elimination of flare. Jena glass, of maximum transparency, is used in manufacture, and there are no cemented surfaces, which enables the lenses to be used with the most powerful illuminants. The lens is supplied in standard iris mount, but has in addition a rotational movement which enables the iris markings to be turned into the most

convenient position. Eleven different focal lengths are supplied, ranging from 2½ ins. for Contax and Leica negatives up to 10 ins. for 1/1-plate. Prices range from £5 12s. 0d. to £22 10s. 0d.

ULTRASORBAN FILTERS AND ARNZ SUPPLEMENTARY LENSES.

(Sold by F. Morat & Co., Ltd., 68, Basinghall Street, London, E.C. 2.)

Ultrasorban filters are solid Jena glass optical filters of high quality, made in four grades of uniform tint and a sky filter, whilst the Arnz supplementary lenses include a portrait and two wide angle positive lenses and two tele negative lenses. All are made in a variety of sizes and in special mounts to fit standard cameras such as the Leica, Rolleiflex, Retina and Contax. Apart from the really excellent quality of these slip-on accessories, they have the additional advantage of relative cheapness. Some very attractive counter showcases and display cases are available, and a really informative leaflet going into the whole question of the use and effect of filters in relation to different types of film has been prepared with the special object of explaining the whole matter in a way that is easily understood by the ordinary amateur.

ILFORD BROMIDE PAPERS: LUSTRE SERIES.

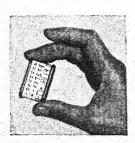
(Made by Ilford Limited, Ilford, London.)

. Messrs. Ilford Limited have added four new grades to their new series of "Lustre" bromide paper. These are an ivory tone fine grain, white linen, cream linen, and cream rayon, all double weight. All the papers in this series are characterised by very rich quality, the sheen of the lustre surface giving great depth and richness to the shadows as well as fine gradation and delicacy in the light tones. These new papers are sure to become the favourite of many photographers, as their quality shows the work in its most favourable aspect.

THE LEUDI EXPOSURE METER.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

The Leudi can justly claim to be the simplest, smallest and lightest



meter in existence. It works on the extinction principle, and is sounder in principle than some, in that it will discriminate between the different areas of the subject and is used with the eye unscreened from the light. One observation is taken, and one transparent scale—wrapped round the outside—adjusted. Tests show that the readings are surprisingly accurate for so simple an instrument, and there can now certainly be no need ever to be without a meter on the score either of expense, or the inconvenience The price is only of carrying one. 5s., purse case 1s. extra.

THE VOIGTLÄNDER BESSA CAMERA.

(Sold by Schering, Ltd., 188/192, High Holborn, London, W.C. 1.)

Among so many well-made folding film cameras, some special feature is needed to raise a new camera above the general level. The Bessa has several such features. It is a 31×21 in, camera taking eight normal exposures or 16 half-size pictures on an eightexposure spool by means of a removable mask. Its great feature is the trigger release beneath the baseboard, and we found on trial that the release in this position enables the camera to be held rock-steady. Another point which greatly appealed to us was the ease of loading. A touch on a protecting flap brings the whole spool cradle out of the camera, so that there is no groping about for pivots and winding slot with the spool half in position. We should say that this is about the best and quickest loading device we have yet seen, and very few cameras appear to have adopted it up to the present. The price of the camera is £7 5s. with Voigtar f/4.5lens and D.A. Compur shutter, but a range of different lenses is available, from the f/7.7 model with Singlo shutter at £2 12s. 6d. to the f/4.5 Skopar-Compur model at £8 8s.

AIR SURVEY.

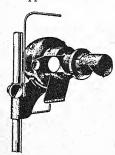
(Aerofilms, Ltd., Bush House, Aldwych, London, W.C. 2.)

Aerofilms, Ltd., are equipped for every description of air survey work, as is evidenced by the fact that they have been appointed the official air survey contractors to the Ordnance Survey of Great Britain. They have in hand Ordnance Survey contracts for air photographs covering about 260,000 acres in the Midlands, including rectifying and enlarging to a scale of 25 in. to the mile. Further contracts include a number for municipal authorities, main-line surveys for railway companies, and land drainage surveys on various estates in Derbyshire, including that of the Duke of Devonshire at Chatsworth.

THE CERTOS ENLARGER.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

The Certos Enlarger has been designed specifically with the object of reducing the procedure of enlarging to the utmost simplicity, and the apparatus to the smallest possible dimensions. The first purpose



is achieved by incorporating an ingenious exposure meter and paper selector and by providing a permanent independent focussing object, in the form of a double arrow and cross-lines, which ensures sharp pictures even from dense negatives and simultaneously indicates the magnification. Interchangeable carriers facilitate enlarging from single negatives, and a mask provides for enlarging from any of the three sizes 4×4 , 3×4 , or $2 \cdot 4 \times 3 \cdot 6$ cm. Enlargements up to 6X can be made direct, and up to 10X over the edge of the table. Size and weight are reduced by employing an efficient ellipsoidal reflector which utilises to the full

extent the light of the 15 watt bulb, the small size and consumption of which necessitate only a small housing; a great saving of space is also effected by utilising indirect projection, the beam being turned through 90° by a special non-tarnishing surface mirror, giving 96 per cent. reflection and withstanding all ordinary handling. Thus the whole apparatus, packed, occupies a space of $14 \times 12 \times 7$ ins. weighs less than 10 lbs., and costs only £9 9s. with $f/4 \cdot 5$ 6·5 cm. helical focussing lens.

THE ILFORD SELO AMATEUR PHOTOGRAPHIC HANDBOOK.

(Published by Ilford Limited, Ilford, London.)

This is a new handbook which no amateur should be without. Although the foreword states that it has been written for the novice, the book goes far beyond what a novice would require, but so clearly and simply is it written that no one commencing photography could have the least difficulty in following the instructions given throughout its 180 pages and acquiring thereby a sound knowledge of the art of producing a good photograph. The price is 1s., by post 1s. 4d.

AGFA ISOPAN I.S.S. ROLLFILM.

(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

Isopan I.S.S. rollfilm is a double-coated panchromatic film, rated at 19/10°DIN, a slight advance on the 18/10° rating of the Superpan which it supersedes. It is a highly panchromatic, but not overred sensitised material which requires only a light yellow filter for almost perfect correction in daylight; in half-watt lighting good correction is obtained without a filter, but a light green filter is an advantage. The film has ample latitude, and a density of 2.7 is easily reached, with a gamma of about 0.75, without any sign of over-exposure. Shadow detail is rather slower in coming up than is the case with Isopan Fine Grain, so that under-development should be avoided if full advantage is to be taken of the high speed of the film. Grain is about normal for a fast material of this class. On test, by daylight, the speed proved to be about equal to, or slightly higher than that of Isochrom. Halation is effectively prevented by a green backing which disappears in the developer.

THE ELTRON IMMERSION HEATER.

(Sold by Sands, Hunter & Co., Ltd., 37, Bedford Street, London, W.C. 2.)

For rapid heating of developer, fixer or water the Eltron immer-



sion heater could hardly be bettered. It can be immersed, without fear of damage, in any of the ordinary photographic solutions. It is universal for all voltages from 110 to 250, and is simply immersed in the liquid and plugged in to a lamphonder or wall plug. Tested on 230 volts on a pint of water in an oxdinary jug-there is an adjustable clip to enable the heater to be hooked on to vessels of varying height—it heated it at the rate of 35° F. per minute: on lower voltages the heating would be correspondingly slower. It is a beautifully finished accessory and costs only 12s. 6d. with a year's guarantee.

AEROGRAPH AIR COMPRESSOR.

(Made by The Aerograph Co., Ltd., 43, Holborn Viaduct, London, E.C. 1.)

For really good results with the Aerograph air brush, it is essential to employ some means of maintaining uniform air pressure independently of the operator, whose whole attention should be free for his work. The hand and foot compressors, whilst performing excellently within the scope for which they are designed, do not leave the operator entirely free, and the Aerograph Company's AC1 Air Compressor Unit should therefore find a ready welcome in studios in which only one air brush is employed—a larger model, the AC2, is available for heavier duty up to four air brushes. The compressor unit comprises an electric motor, the compressor itself, and a welded steel air receiver, with its necessary safety valve and pressure gauge, draw-off tap and drain tap. The whole apparatus is mounted on a sturdy metal base with rubber buffers. The machine is remarkably silent in operation, and since the motor is automatically cut off the moment the pressure reaches a pre-determined point, unnecessary noise is reduced to the absolute minimum. Electric current is also saved, of course, by the cut-off device, although the current consumption, in any case, is very low. An attractive booklet, describing the principle, operation and applications of the Aerograph air brush will be sent post free to any applicant.

THE F/3.8 ROLLEICORD.

(Sold by R. F. Hunter, Ltd., 51, Gray's Inn Road, London, W.C. 1.)

The new Rolleicord is a notable advance on its justly popular predecessor. First and foremost it is fitted with a Zeiss Triotar $f/3\cdot 8$ lens in place of the $f/4\cdot 5$ Triotar. The Triotar is, of course, of simpler construction than the Zeiss Tessar, as fitted to the more expensive Rolleiflex, having one component less. Actual tests, however, show that the definition is surprisingly good at full aperture. In addition, the $f/3\cdot 8$ model is, like the Rolleiflex, adaptable for plates as well as rollfilms, and all Rolleiflex accessories can be used with it, excepting only the cine film attachment and angle mirror. The price of the new model is £14, ever-ready case £1 extra. The original $f/4\cdot 5$ Rolleicord will continue to be manufactured, the price being £11 15s. 0d.

THE STABILO BALL-AND-SOCKET TRIPOD.

(Sold by the Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)

This is a very good little tripod. It is exceedingly light, but very rigid: there is no sloppiness about the legs when extended, and the method of construction would seem to guarantee that shake will not develop over a long period of use. The spring locking catches are positive in action, but there is no difficulty whatever, as in some telescopic tripods, in closing the various sections. The ball-and-socket head is particularly good. Unlocked, it is completely loose, but half a turn locks it positively. Some heads of this type require considerable force to make them secure: this one

THE BENTZIN PRIMAFLEX MIRROR REFLEX CAMERA.

does not. The height extended is 4 ft., the length, closed, 17 ins.

It has three extensible sections. The price is 12s. 6d.

(Made by Curt Bentzin, Görlitz, Germany.)

The Primaflex is a one-lens reflex for 12.6×6 cm. pictures on a 6×9 cm. spool, possessing the unique feature that a single revolution of the winding head automatically performs four duties—winding the shutter, moving on the film, and operating the counter and mirror. This ensures speedy operation and also renders double exposures impossible. The new model has a delayed action focal plane shutter speeded from 1 to 1/1000 sec. Lenses are interchangeable and objectives up to a focal length of 40 cm. are available. Although primarily designed for use with 6×9 cm. rollfilms, the camera can also be used without alteration with dark slides for 6×6 or $6\times4\frac{1}{4}$ cm. plates.

THE PLAUBEL AUTOMATIC ROLL HOLDER.

(Sold by Garner & Jones, Ltd., Polebrook House, Golden Square, London, W. 1.)

The Plaubel Roll Holder enables plate cameras to be used with $3\frac{1}{4} \times 2\frac{1}{4}$ in. rollfilm spools, either for 8 full frames or for 16 exposures $2\frac{1}{4} \times 1\frac{1}{2}$ in. It is a well made instrument that will give good service over a long period of use. It has been very carefully thought out in every detail, and is designed to overcome the difficulties usually associated with devices of this kind. The automatic winding and counting mechanism is the same as that of the Roll-Op camera, described elsewhere in this section, and renders the accessory an instrument of precision. It is extremely convenient to use and quick in operation. The price is 50s.

KANDEM 2 000-watt OVERHEAD SPOTLIGHT.

(Made by Kandem Electrical, Ltd., 711, Fulham Road, London, S.W. 6.)

This is a high efficiency spotlight designed for overhead use in



portrait and commercial photography. Its high efficiency is secured by the use of a short-focus stepped lens working in close proximity to a 2,000-watt short type studio lamp. A skirt shields the direct light of the lamp from the camera, and, in some cases, from the background, and a wire guard is fitted beneath the lens. The lamp-holder can be focussed, and the whole body of the projector is carried on a universal trunnion arm which enables it to be tilted up to 90° from the vertical. The price of the spotlight without lamp is £7 10s. 0d. Messrs. Kandem also manufacture high-power reflector lighting units for cinematography and other purposes. Particulars of these will be furnished on application.

D. & P. DEVELOPING TANKS.

(Made by Hathernware, Ltd., Loughborough.)

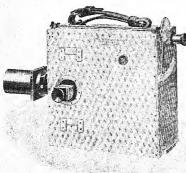
The glazed acid-proof developing tanks manufactured by Hathernware, Ltd., are well known to the D. & P. trade on account of their freedom from corrosion, cleanliness in use, and other advntages over other tanks. Three sizes are now stocked-36 × 6 × 6, 47 × 8½ \times 8½, and 47 \times 17 \times 8½. As usually supplied, they are of high quality brown glazed acid-proof stoneware, but they are also made to order, at a slightly increased cost, in white glazed ware, which obviously has the advantage of better visibility in the dark room. The top of the tank is grooved for the reception of film racks, and on the 47 in, tanks an overflow hole is provided to prevent overfilling. A glazed stoneware tap is fitted, or a simple rubber bung, if desired, at a corresponding reduction of cost.

CINE REQUISITES.

"N.S." AUTO KINE' 35 mm. CAMERA WITH PARALLAX COMPENSATION.

(Made by James A. Sinclair and Co., Ltd., 3, Whitehall, London, S.W. 1.)

Messrs. Sinclair have now added a further feature to their well known Studio model of the Auto Kine'—that of parallax compen-

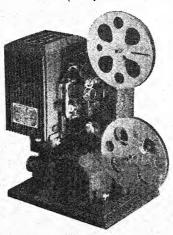


sation. The finder evepiece, formerly fixed, is now mounted on a slide engraved with a scale of distances, and can be set in an instant to the distance for which the camera is focussed. whereupon parallax is eliminated for that distance. This is particularly simple with the Studio model, which has a large lever control for focussing at the back of the camera, with engraved distance scale so that the focus and

parallax settings are always simultaneously visible and can easily be kept in step. The first camera to be equipped with this parallax adjustment was that used by Mr. R. J. Flaherty for his film "Man of Aran," which, it will be remembered, won the international award for the best film of the year at Venice in 1934, and it is interesting to note that it was the same type of camera that was employed by Mr. Basil Wright for the film which won the corresponding award at Brussels last year—"Song of Ceylon," produced under his direction by the G.P.O. Film Unit at the cost of the Tea Propaganda Board. The "N.S." Auto Kine' camera accommodates 200 feet of standard film in the interior of the case—there are no projections or excrescences—and runs the whole length through at one wind of the clockwork mechanism at speeds from 10 to 24 frames per second. Loading can be done in the dark. and threading is the work of a moment, whilst the facilities on the camera include a rewind for mixes and a "one turn one picture" handle, a filter holder which enables screens to be inserted or quickly changed, and reflex focussing for close-ups and special work, or when using long focus lenses. Two features worthy of special notice are firstly that the "N.S." Auto Kine' camera is particularly suited for work in the tropics or under any conditions of great heat, on account of its unenamelled metal body, and secondly its eminent suitability for aerial cinematography, as proved by the fact that it is used by the Royal Air Force, and was chosen by Messrs. Gaumont for their film of the Houston Everest flight, three "N.S." Auto Kine' cameras being used on this occasion.

KODASCOPE EIGHT-80 PROJECTOR FOR 8 mm. FILMS.

(Sold by Kodak Ltd., Kingsway, London, W.C. 2.)

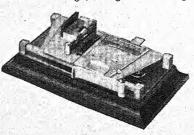


In appearance this machine the Kodascope resembles Eight-60 projector. It is, however, fitted with a 300-watt lamp, for which the necessary fan cooling has been added. The lamp itself is an American Mazda, and differs from the existing standard 300-watt lamp in that it has only two short coiled-coil filaments. which have a relatively small area, and are responsible for the extremely bright picture which the machine gives; the brilliance, from so minute a frame as that of 8 mm. film is. indeed. surprising. machine has a bronzed crystalline finish, and sells at £33, including the supplementary resistance and case.

THE ENSIGN UNIVERSAL FILM SPLICER.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

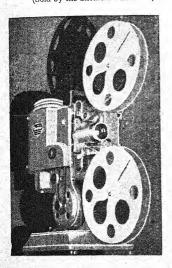
Pursuing their policy of making their accessories serve as many purposes as possible by virtue of interchangeable components and careful design, Ensign have brought out this splicer, which is



equally efficient with all five sub-standard varieties of film-8, 9.5 and 16 mm. silent and 16 mm. DIN and S.M.P.E. sound. This is effected by using one row only of pins for the 8 and 16 mm, and one for the 9.5, machined with such accuracy and placed so ingeniously that the film is held accurately in though place even

shrinkage may have taken place, whilst the method and accuracy of manufacture are such that every splicer is dead accurate. Points of importance are the fixed depth scrape whereby it is impossible to scrape deeper than is sufficient to remove the emulsion and roughen the celluloid surface; ground steel cutting blocks and scraper guide ensuring registration of the scraped track and cut edges; dead hard scraper hardened after grinding, and in general the very great convenience and speed of working secured by a design which is the outcome of a wide experience, in the Ensign film library, of every difficulty that is likely to be met with in practice. The price, complete with bottle of cement, is £2 15s.

AMPRO MODEL J. 500 watt 16 mm. PROJECTOR. (Sold by the Sheffield Photo Co., Ltd., 6, Norfolk Row, Fargate, Sheffield.)



Perhaps the most important point on this machine, apart from the high illumination, is the claw movement with its patented "kick-back" mechanism which lifts the claws from the sprocket-holes before actually withdrawing them, so reducing wear on the film. Coupled with this is a high rate of picture shift which helps towards flickerless projection as it gives a longer period of light transmission. The drive is by moulded cord belt and this again tends to relieve the mechanism of sudden stops and starts. All the usual features that one would expect to find on a machine of this class are there. power rewind, reverse and still pictures, oiling from a central well, and centralised controls. The price of the projector is £37 10s., or with de luxe carrying case and transformer £39 10s.

SELO 9.5 mm. CINE REVERSAL FILM.

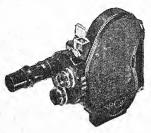
(Made by Ilford Limited, Ilford, London.)

With the advent of this film the 9.5 mm user is admitted to the ranks of Selo users. In it he has a film of fine grain and good colour sensitivity: green and red balancing well in the same shot, whilst the speed is well up to the maker's statements. Latitude, as tested by a trial film deliberately under and over exposed and processed by the manufacturers, is good for this class of film. The film arrives packed in a solid pressed steel charger accompanied by instructions which form one of the best short guides to amateur cinematography that we have lately encountered. The exposure guide is exceedingly complete, and in addition to information for daylight working, data and helpful suggestions are given for artificial lighting. The price of the film, 5s. 6d. per charger, includes processing, from which it is returned well packed for postage in a pressed steel spool suitable for the standard projector, and with a conveniently removable lid useful for editing or the insertion of another length if desired. It is accompanied by a short criticism.

THE ARGUS 9.5 mm. CINE CAMERA.

(Sold by the Camera Co., 320, Vauxhall Bridge Road, S.W. 1.)

The Argus is a real innovation in low-priced 9.5 mm. cinematograph cameras. Ross lenses are fitted as standard to a circular three-lens turret with a smooth but positive action; 100 and 50 ft.



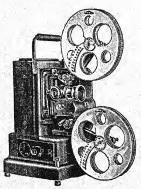
daylight loading spools may be used, and the film movement consists of sprocket feed, claw and sprocket take-off with a friction driven take-up spool. However, upon reversing the motor the film can be rewound on to the top spool (which then becomes friction driven while the bottom spool rotates freely) with the full power of the motor. Provision is also made for normal release, held down release and a single-picture exposure device.

The usual disc type footage indicator is fitted and in addition another indicator to show the state of tension of the motor-spring. In the price of 32 gns. is included a leather carrying case; one of the rare occasions in which a manufacturer thinks sufficiently well of his product to include a case in the price.

PAILLARD BOLEX TRIFILM G3 PROJECTOR.

(Sold by Cinex, Ltd., 70, High Holborn, London, W.C. 1.)

This projector should solve the problem of the amateur who may already have films on either of the more common sub-standard gauges and who has recently purchased an 8 mm. camera, and



does not want to invest in more projection apparatus. It should also prove useful to amateur cinematograph associations who may be called upon to project all the various gauges of film. The machine is heavy and the main frame is a casting, the whole having a smooth finish with no ugly corners to collect dirt or scratch the films. The lamp wattage of 500 ensures brilliant pictures in all gauges, and makes it possible to show approximately an 8-ft. picture from 8 mm. film. A 250-watt lamp is interchangeable with the 500-watt, and costs £1 1s. 0d. Forward and reverse running are arranged for, as also is a declutching device for still pictures. The change-

over from one size of film to another simply means the removal of the gate and two sprockets, and is simple to carry out. The

price of £60, with 2-in. or 1½-in. lens, and 110 volt 500-watt bulb, is little, if any more, than that which one would normally expect to pay for one machine for one gauge of film. For the projection of 8 mm. films a special Hugo Meyer 20 mm. lens can be supplied at a cost of £4.

THE ENSIGN-SIMPLEX POCKETTE 16 mm. CAMERA.

(Sold by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

The Ensign-Simplex Pockette claims to put "Home Movies in Your Pocket," and despite its small size it is a soundly made and well designed camera. It is daylight cassette-loading, and even partly exposed cassettes can be interchanged in full sunlight with but three frames fogged, the operation taking only five seconds. Cassettes hold 50 ft. of Kodak pan or SS pan film, and the twospeed motor, which despite its slim build has two springs in tandem, runs for 25 ft. on one wind. A footage indicator is incorporated. The release button admits of single frame exposures and can be locked for continuous running. A pre-set disc enables the motor to be set to run for any predetermined footage. A waist-level and a direct-vision finder are provided, the latter having masks for the telephoto lenses. The price of the camera with the standard fixed-focus 1-in. Ensar $f/3 \cdot 5$ lens is £20 or £25 with a 1-in. Dallmeyer $f/2 \cdot 9$ in focussing mount. These are both interchangeable with a 2-in. f/2.9 and a 3-in. f/3.5 Dallmeyer lens. Accessories include a soft pigskin pouch for the camera only, and a handsome fitted leather case for camera, two chargers, filters, exposure meter, etc. This is not a cheap camera, but it is emphatically a camera for those who regard as a first consideration the utmost convenience and portability-combined with reliability.

DALLMEYER CINE LENSES.

(Made by J. H. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

Messrs. Dallmeyer, always to the fore in the design of lenses for the many special purposes which are continually arising, have recently introduced a number of new ciné camera lenses. These include a new $3\frac{3}{4}$ -in. $f/3 \cdot 3$ telephoto in micrometer focussing mount at £10; a special 3-in. f/4 telephoto for the Ciné-Kodak Eight-20 at £5 5s. plus fitting (the previous lens was of 1½ ins. focus only); and a 15 mm. f/1.5 wide-angle anastigmat in micrometer focussing mount for 16 mm. cameras at £10. A special 13 mm. f/1.9 lens in micrometer focussing mount is also made for the various 8 mm. cameras at a price of £8 8s. All the above lenses are supplied for any standard camera except where specified. New Dallmeyer Projection lenses include one of 3 in. focus for the Kodascope Eight-60 and Eight-80 projectors, giving a larger picture and more illumination and contrast, and retailing at £3 3s.; f/1.8 lenses from 1 in. to 4 ins. for Siemens-Halske, Bolex D.A., P.A. and G. and Pathe machines—also price £3 3s.; and an entirely new series, the Dallmeyer Max-Lite, of high light transmission, for all 16 mm. projectors in focal lengths of 2, 21, 3, 31 and 4 ins. at prices from £6.

BAUCHET 9.5 and 16 mm. ORTHOCHROMATIC REVERSAL CINE FILM.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

Practical tests on this new material indicate a speed slightly above the normal, i.e. a little more than 19° Scheiner. Half of the test film returned to the suppliers for professional processing showed signs of over development, but still retained fair quality. which we processed ourselves showed good quality rendering of both high-light and shadow detail, with a reasonable latitude as regards The grain, as is to be expected with medium speed orthochromatic material, is fine enough not to be noticeable. Prices are as follows: 9.5 mm., 2s. 3d. per 30 ft.; 16 mm., 6s. 6d. per 50 ft., and 12s. 0d. per 100 ft.

THE MEYER F/1.5 PRIMOPLAN LENS.

(Sold by A. O. Roth, 85, Ringstead Road, Catford, London, S.E. 6.)

This is a new five-lens objective with two elements cemented. which gives great speed and admirable definition at all apertures. Its speed renders it particularly suitable for night work, studio and all indoor work, but it is really a universal lens and is very



efficient for ordinary daylight work at correspondingly smaller apertures. Owing to its aperture, a deep hood should be used; additional hoods are supplied as extras by the makers. Only one focal length is made-1 in.-in precision focussing mount with clearly engraved stop and focussing scales. The lens is also supplied specially mounted for Bolex, Siemens, Ciné Nizo, Ciné Kodak and other cameras. The price is £14 10s. Another series, of f/1.9aperture and 31 in. focal length is made

interchangeable focusing mount for the Exakta camera at the price of £10 18s. 0d. Other foci, for miniature cameras, are in preparation.

WRAY UNIVERSAL TRIPOD HEAD.

(Made by Wray, Ltd., Optical Works, Ashgrove Road, Bromley, Kent.)

By adding this tilting and panning head to any ordinary well-made tripod, a universal ciné tripod is obtained in a convenient form and at a low price. The head is of solid metal construction, with a 21-in. table, and is notable for three special features. The pan motion is on ball bearings, ensuring smooth motion and lasting wear. The guiding handle, which is 11 ins. long, is so arranged that it can be attached in any position and turned to any angle so that the bent end comes in the position found most convenient by the individual user and for any particular shot or circumstances. Thirdly, a particularly well designed quick-attachment device for the camera is provided. A cylindrical boss with standard thread is screwed into the camera and, for attachment, inserted into a corresponding hole in the table. A slight rotation of the locking handle then holds the camera securely captive but allows it to be rotated into the desired position; a further turn then locks it securely. Conversely, the camera is instantly removable without unscrewing it. All locking motions are positive and secure. The price is £2 8s. 0d.

THE B.T.H. OPTICAL REDUCING PRINTER.

(Made by the British Thomson-Houston Co., Ltd., Rugby.)

The B.T.H. Co. have made no change in the 1936 model of their 16 mm. Sound-on-Film Projector. This instrument, with its undistorted output of 5 watts and 10-12 ft. screen picture, is adequate for audiences of 400 to 500 people. Its price remains at £175. In addition, the B.T.H. Co. has now developed an optical Reducing Printer which enables 35 mm. sound films to be reduced to corresponding 16 mm. size. Both 35 mm. and 16 mm. films are drawn through the printer at opposite ends of a reducing optical system, each at its appropriate speed, and a continuous reduced 16 mm. image of the 35 mm. track is obtained. This process is now generally acknowledged to be the most efficient method of obtaining 16 mm. sound films, and the results obtained with the B.T.H. apparatus are excellent.

NEW VICTOR CINE CAMERAS AND PROJECTORS.

(Sold by J. H. Dallmeyer, Ltd., 31, Mortimer Street, London, W. 1.)

Several interesting new products of the Victor Animatograph Co., of Davenport, U.S.A., are now available. The model IV camera is slightly simplified from the well-known Model V, whereby it has been possible to reduce the price from £45 to £35, with Dallmeyer 1-in. $f/2\cdot 9$ Triple Anastigmat in micrometer focussing mount. The back-turn is dispensed with, and there are only four speeds as against five, but in other respects the new model incorporates the features of the Model V camera. Other new models include a 1,600-ft. capacity built-in projector with 750-watt "Hi-power" illumination and spiral draught ventilation, new swing-out lens mount and rapid rewind; and a new model of the Animatophone, Model 25, designed to meet the need for a simpler, lighter-weight sound outfit; this uses a 500-watt lamp and weighs only 50 lbs. A separate loud speaker is provided.

THE SKS TITLER.

(Sold by Cinepro, Ltd., 1, New Burlington Street, London, W. 1.)

The SKS Titling Apparatus is an engineer-built instrument designed to place in the hands of the amateur the means of producing all manner of straight and trick titles with the minimum of skill and practice. It is built on the unit principle, so that whilst a good variety of work can be done with the basic equipment, accessories can be added later for producing difficult trick titles—climbing or jumping titles, or titles with growing or diminishing letters. Any amateur ciné camera can be accommodated, and the adjustments throughout are standardised, simple and quick. In

conjunction with an ordinary camera, the apparatus can be used for copying or enlarging from ciné film or Leica negatives. whole apparatus closes down without dismantling, and when closed measures 21 × 13 × 7 ins. high, and weighs 10 lbs. The price is £10 10s. 0d. for the basic equipment, £15 with accessories for growing and climbing titles.

THE KINOX 16 mm. CINE PROJECTOR.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

A new model of this projector has been produced since last year. In general layout and appearance the new model follows exactly the lines of its predecessor, but with certain important improvements. Thus the machine will now take up to a 500-watt lamp, and the lamp resistance, which was formerly housed within the body of the projector, and could only be changed, for a different line voltage, by removing the side of the projector, now plugs in to the lamp housing and can be changed in a moment. Other improvements are the fitting of a reverse motion through the gate and the provision of a pilot light within the case of the projector.

THE LAACK TELEPHOTO LENS.

(Sold by M. Janovitch & Co., 19, Broad Street, Golden Square, London. W. 1.)

The Laack f/3.5 Dialytar anastigmat is a lens which should be very welcome to amateurs to whom the cost of such accessories is usually a deterrent. The quality of the lens, both in definition



and in design, mechanical workmanship and finish, is as high as the price-£6 6s, 0d.—is low. The lens is a 4-component uncemented combination, with focussing adjustment from infinity to 4 ft., and iris diaphragm to f/22. The two adjusting collars

are heavily knurled and provide an effective grip. The focussing scale is very open, even at the longer distances—an important feature in a telephoto lens. All engraving is clean and bold. The lens, which is provided with a deep lens hood, is suitable for fitting to any 9.5 or 16 mm, ciné camera with standard lens mount.

ENSIGN UNIVERSAL FILM EDITOR AND 400 ft. REELS.

(Made by Ensign, Ltd., 88/89, High Holborn, London, W.C. 1.)

In the Universal Editor the Ensign policy of universality has been carried a stage further in that not only are interchangeable film spindles provided for all substandard film, with quick interchange, but the base board is provided with a row of sockets into which are simply plugged a single splicer, or two in tandem for rapid working, or other possible editing facilities. The gears of the winders are substantial and very easy running, and are built for long service. The whole equipment should be of the greatest value to libraries, clubs and in fact all who have more than one gauge to cope with. The new 400-ft. reels for 16 mm. film are deserving of special notice. They are made of a special metal which has the elasticity of steel, and which can be relied upon to retain their shape under all ordinary conditions of usage. The simple slide film clip is particularly effective and is both quick to use and secure in its hold on the film. A footage indicator is provided. The price is 4s. 6d.

DOMESTINO MOVECTOR (BILLY) 16 mm. PROJECTOR.

(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

As its name implies, this projector is intended primarily for home use, and therefore as would be expected, simple and straightforward in design. It is built up principally from heavy die-castings



of excellent finish. Despite its lack of "gadgets" provision is made for showing on any voltage(with an internal resistance), showing still pictures and at varying speeds of the motor. All the electrical side of the machine is fully shrouded and well carried out. The lens mount and the gate front swing out together to facilitate cleaning. The framing is carried out with an ingenious cam movement controlled by a small knob on the operating side. With its 100 watt lamp, this projector selling at £17 should interest

those who require a really substantial small projector.

FILMO "STRAIGHT" 8 mm. CAMERA.

(Sold by the Bell & Howell Co., Ltd., 320, Regent Street, London, W. 1.)

That the whole of the mechanism of a cinematograph camera can be confined within the small limits of a mere handful of brown crackle case must surely be the limit to which a manufacturer can go.



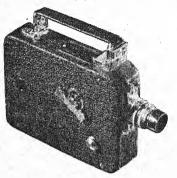
This tiny instrument is perhaps one of the finest pieces of precision work on a small scale that we have seen. For all this, it has features that cameras much bigger never had. The standard lens has a focal length of 12½ mm. and is fitted with an interchangeable device, so that a lens of 1½ ins. focal length may be used for telephoto work. The film stock is not the usual 16 mm. size which is later slit and joined end to end, but a special 8 mm. film in a 30-ft. length. Four taking speeds are provided, 8, 16, 24 and 32 frames per second, and

even at 32 frames per second this small camera is particularly silent. With the standard lens the price is £19 15s. 0d.

THE CINE-KODAK EIGHT, MODEL 60.

(Sold by Kodak, Ltd., Kingsway, London, W.C. 2.)

The Ciné-Kodak Eight-60 is an elaboration of the well-known Eight-20 designed to meet the requirements of those 8 mm, workers who wish to enjoy the advantages of a telephoto lens. The interior



mechanism follows exactly the lines of the Eight-20, but is, if anything, even more finished. perfectly ternally, also, the new camera is similar in design to the model 20, but with two most important additions, First and foremost the new camera provides for interchangeable The standard lens is a 1-in. Kodak anastigmat, working at f/1.9, whilst the alternative lens, which is interchanged by the simplest of safety-catch devices, is a $1\frac{1}{2}$ -in., working at $f/4 \cdot 5$. The

advantage of this long-focus lens will be obvious, and it will certainly greatly increase the scope of the camera. The other addition is an ingenious device whereby the insertion of the longfocus lens automatically converts the normal optical viewfinder into a straight-through finder corresponding to the view-angle of the long-focus lens by swinging down the negative lens out of the path. A touch on the eye-lens carrier at the other end completes the conversion by removing the positive eye-lens also, leaving a clear path. The price of the new model is £25 with standard lens, complete in case. The telephoto lens is £8 8s. 0d. extra.

THE LINHOF TRIPOD.

(Sold by R. E. Schneider, 189, The Grove, London, W. 6.)

The Linhof is a light, all-metal tripod with legs of hollow U-section giving both strength and rigidity whilst keeping weight down to a minimum. The legs have two freely sliding sections, locked with wing nuts; each leg has a separate locking lever and in addition a positive stop to prevent excessive spreading. The points are very quickly reversible for rubber feet by loosening a milled head. The head has a full circle rotation, divided every 10°, and is locked by a milled head. A spirit-level is let in to its base. The tilting motion is ample-about 80° forward and some 60° back-and is locked by a turn of the guiding handle. A quick attachment device for the camera is provided, the camera screw having a cylindrical base which is dropped into the leather surfaced table and locked in an instant. The tripod is excellently finished in polished metal and crystalline lacquer. Its length fully extended is 56 ins. and closed 27 ins. The price is £5 19s. 6d., case 6s. 6d. extra.

MOVECTOR SUPER 16 mm. PROJECTOR.

(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

A new model of unusual and careful design—the machine, though totally enclosed, is not housed in the conventional wooden case. but its shape is boxform and of metal, various doors being provided to give access to the mechanism for threading, lamp adjustment and shutter changing. Two shutter blades are supplied, a single bladed one for running at 24 pictures a second, and a double bladed one for 16 pictures a second. This means that at either speed the machine is run at its maximum efficiency. Every refinement is provided, including built-in resistance for all voltages, and a transformer for alternating current, framing, still picture, fully adjustable gate-pressure, forward and reverse running and with it power rewind, starting-switch interlocking with the lamp resistance to prevent over-loading on starting up the machine, threading-light. ammeter and extension arms for 800-ft. reels. The entire assembly of the lens-mounting and the front portion of the gate are completely removable so that proper cleaning is possible. Particular attention should be paid to the electrical side of this machine—it is one of the first to have definite provision for "earthing" and for the instruction book to lay stress upon the necessity for this most important provision. At £75, it is an attractive and interesting machine of the 375 watt class.

PAILLARD-BOLEX H-9 AND H-16 CAMERAS.

(Sold by Cinex, Ltd., 70, High Holborn, London, W.C. 1.)

Two models of this new departure in substandard camera design are available, one for 16 mm. and one for 9 mm. film, in each case the basic design being the same. That it should be possible to make the whole so compact is rather astounding considering how many features there are. Space saving seems to be the key-note of the design—for the three lens turret is only a half-circle instead of the usual complete circle, so that when the turret is in its normal position it does not project beyond the sides of the main body of the camera. To the discerning amateur and to the professional using substandard film there are several points of particular appeal, two of them being exclusive. The first is the viewfinder which can be placed in two positions and also has provision for complete parallax adjustment down to 20 ins.; the second is that the spring motor can be totally disengaged from the camera mechanism proper by means of a clutch. Due to this complete de-clutching it is possible to rewind the whole of the film if necessary, and so make any number of complicated double or treble exposures accurately as the counter also counts backwards! The other features are variable speeds of running, footage meter with audible indication as well, single picture exposures and interchangeability of lenses in the turret. Finally, mention must be made of the semi-automatic threading, and a neat little film cutter in the inside of the camera for the accurate shaping of the film-end for the auto-threading device. The price of either model is £49, which cannot be considered excessive in view of all the features of each.

THE WRAY TELEPHOTO LENS.

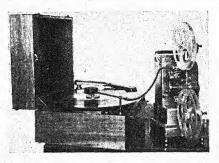
(Made by Wray, Ltd., Optical Works, Ashgrove Road, Bromley, Kent.)

This old-established firm, makers of some of the very early photographic lenses, and of late years noted particularly for their apochromatic process lenses and prisms, now supply a 2-in. telephoto lens, working at an aperture of f/4.5. This is made in a focussing mount scaled to 4 ft., the helical motion being very smooth and the general finish excellent. The lens fits most sub-standard cameras, including the Miller and Dekko. The price is £3 15s. 0d.

KINTOSOUND HOME TALKIE OUTFIT.

(Sold by City Sale & Exchange, Ltd., 59, Cheapside, London, E.C.2.)

The basis of the outfit is a special induction motor with a twin gearing allowing of the two standard speeds of 331 r.p.m. and 78 r.p.m. for 16-in, talkie-discs and normal gramophone records respectively.



A universal type motor can also be supplied for those who have D.C. mains. Provision is made for plug and jack sockets for connecting to the amplifier or a radio set. The gear-box for connecting the turntable to the projector may also be purchased separately at £4 4s. 0d. For recording, Permarec records are used, and it is stated that good

lip synchronisation has been obtained. The cost of the standard outfit is £11 11s. 0d., or with the universal type motor £12 12s. 0d.

THE ASTRO TRANSFOCATOR.

(Made by Astro-Gesellschaft m.b.H., Berlin-Neukölln.)

The Astro Transfocator is an accessory for 35 and 16 mm. cameras which enables the focal length of the lens to be continuously varied over a range of 2:1, without loss of definition or alteration of effective aperture (speed). It is attached to the front of the ordinary lens and operated by means of a lever. The 16 mm. Transfocator is in the form of a special attachment for the Siemens 16 mm. camera, and in this case also adjusts the field of the finder simultaneously and in agreement with that of the camera frame itself. This 16 mm, attachment has been worked out in conjunction with Messrs. Siemens & Halske for use with their camera. Cinematographers will not need to be reminded of the additional power, by way of special effects, that this new and simple device places in their hands, and of the possibilities opened up by this addition of a new component of motion controlled by the camera.

THE PATHESCOPE 9.5 mm. "ACE" PROJECTOR.

(Sold by Pathescope, Ltd., North Circular Road, Cricklewood, London, N.W. 2.)

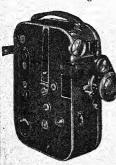


From advance particulars which we have received of the " Ace " projector, it seems safe to say that this will adequately fill a real need for an inexpensive projector of high quality. It is made throughout of solid high pressure die castings; the shutter is three-bladed and specially shaped to reduce flicker to a minimum; threading is extremely quick and simple, and the optical system will, we understand, give easily a brilliantly illuminated picture 2 ft. wide at a screen distance of 8 ft. The machine is supplied with a universal resistance for all voltages or it may be run off accumulators. The price, complete with resistance, is 37s. 6d.

MOVIKON 16 mm. CAMERA.

(Sold by Zeiss Ikon, Ltd., Mortimer House, Mortimer Street, London, W. 1.)

In accordance with the usual practice of this firm this instrument combines accuracy, adaptability and an elegant appearance and in addition a high standard of performance compatible with



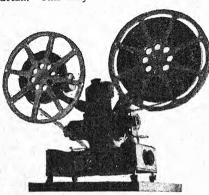
precision apparatus of this class. The numerous features incorporated in it would need more space than is available here to describe—and it is not until one has used this camera personally that its many advantages become fully apparent. To take only one item, and that perhaps the most important, as it is the only camera with it, it is provided with a range-finder coupled with the focussing. Apart from ensuring accuracy in focussing at all times, this means that the operator can follow changes of position of the principle subject, while it is actually in movement and "follow-focus" easily and quickly without previous com-

plicated measurements with a tape. Another point is that by means of the prism behind the film, it is possible with some films to compose one's picture actually on the film in the gate, although for all ordinary purposes the view-finder is fully corrected for parallax, except when working with the supplementary close-up lenses which can be fitted. The price of £98 10s. may be considered high, but not when the many advantages of the camera are all taken into account.

THE FILMO 16 mm. AUDITORIUM PROJECTOR MODEL 130.

(Made by the Bell & Howell Co., Ltd., 320, Regent Street, London, W. 1.)

A sound engineering job, designed for the maximum of convenience and accessibility, clean-lined and perfect in every detail. This may well be said of the whole range of B. & H.



projectors, and Model 130, illustrated, is the summit of achievement. With its fancooled, eight-bar 1,000-watt biplane filament lamp and f/1.65lens it claims 80 per cent, increase of illumination over the 750-watt models. capacity is 1,600 ft .a good hour's run. Special features are the helical gear drive, independent driving the take-up spindle, and fast power rewind, variable lamp

resistance and voltmeter, electric governor, and speed variation from 16 to 24 frames per second, interlocking controls preventing damage through incorrect operation, adequate film cooling and conditioning with a blast of humidified air. The centre of gravity of the whole machine is low, and it has a double tilting motion giving a wide range of tilt. Lenses are readily interchangeable, and the condenser instantly removable for cleaning. The price is £124.

THE SIEMENS MODEL D CAMERA AND ASKANIA MIRROR LENS.

(Sold by Cinepro, Ltd., 1, New Burlington, London, W. 1.)

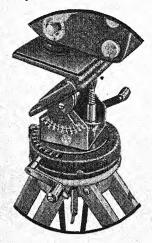
The Siemens Model D Camera has been designed with the object of providing the sub-standard ciné worker-professional as well as amateur—with every possible refinement. It has three lenses, which may be selected from a choice of seven, mounted on a quickchanging slide with which focal lengths from 25 to 200 mm. can be obtained at will. The 200 mm., as also the 75 mm. lens, is the Askania Reflecting Mirror Lens, already known to standard cinematography, but now used for the first time, and exclusively on this camera, for sub-standard work. Its outstanding features are excellent definition, suitability, without re-focussing, for infra-red sensitive stock, and a length no greater than a normal 50 mm. lens, despite its 200 mm. focal length. The camera is daylight loading in one operation, has four speeds-8, 16, 24 and 64 pictures per second—and single frame instantaneous and time exposures; the

speed may be changed whilst running. The motor runs for 20 ft, and has a free-wheel release and footage indicator. The over-all dimensions of the camera are $5\frac{1}{2} \times 3\frac{3}{4} \times 5\frac{1}{2}$ ins., the weight 4 lbs., and the price, exclusive of lenses, one at least of which must be purchased with it, is £78; the Askania 200 mm. lens costs £25, and the other lenses, according to focal length, from £15 15s. to £19 19s.

THE V.N. PRECISION CINE TRIPOD.

(Made by Peeling & Van Neck, 4/6, Holborn Circus, London, E.C. 1.)

The V.N. Tripod is a beautifully finished all-British product, which brings to the sub-standard worker all the advantages of a fully mechanical head. The tripod itself is extremely rigid. The



upper legs are of hard wood and cannot splay beyond a certain angle. The inner legs are of plated metal, reversible for the use of rubber or metal feet. The mechanical head, which is detachable, is of very accurate workmanship. The horizontal and vertical worm motions are very smooth and there is no play or shake whatever. There is a 45° each way tilt, supplemented by an angle table for fully vertical shots. A swing-out spirit level is provided which disappears completely within the base when not required. The height of the tripod is 58 ins. extended and 33 ins, closed, and the price is £7 17s. 6d., which, for so well made an article and for the advantages it gives, is certainly low. A collapsible travelling base, running on ball bearings and with rubber brake stops, can be supplied for shots

which necessitate a moving camera at a price of £1 5s. 0d.

I.S.S. ISOPAN 16 mm. REVERSAL FILM.

(Sold by Agfa Photo, Ltd., 1/4, Lawrence Street, High Street, London, W.C. 2.)

The latest addition to the range of high speed reversal stocks for substandard cameras fully deserves its initials—Isopan Super Special. It is one of the fastest materials which we have tested, and combines with this speed, good latitude and excellent gradation. These points are fully proved by exposures made on interiors and exteriors under both good and bad lighting conditions.

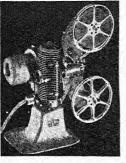
The processing of the material leaves nothing to be desired—the finished positive is free from grain and of a pleasing colour, and combined with this is a speedy service. The stock is available on 50-ft. and 100-ft. daylight loading spools at 17s. 6d. and 32s. 6d.

respectively and in one or two other special packings.

FILMO 8mm. PROJECTOR.

(Sold by the Bell & Howell Co., Ltd., 320, Regent Street, London, W. 1.)

The keynote of this new projector is refinement, both in appearance and in design and coupled with this a sturdiness that is not



marred by clumsiness or weight. Add to this the general reputation of the manufacturer's name and it will be appreciated that this instrument is one of the best of its class. With the 300 watt lamp fitted, pictures of a width of five and six feet are claimed with clear and steady projection. provision of a heat screen and stopping device permits the showing of "still" pictures without risk of damage to There is also provided a the film. power gear-driven rewind, and a conveniently placed pilot lamp for The machine is priced threading. at £41 and brings to the 8 mm. user

facilities which previously have been confined to 16 mm. equipment.

PORTABLE CINE TRIPOD.

(Sold by Actina, Ltd., 29, Red Lion Square, London, W.C. 1.)

This new telescopic tubular tripod is constructed of duralumin, and is claimed to be the lightest and most compact tripod for ciné amateurs' use yet produced. Its weight is only 3 lb. 14 oz.



It has a smooth tilting motion, firmly locked by half a turn of the guiding handle, which unscrews for carrying, and is screwed up again out of the way beneath the head and between the tripod legs. There is a full circle rotation of the head, which is divided every six degrees, firmly clamped by the lever on the right. The legs are 4-section, and 58 ins. long, extended, from points to table, the top, fixed section being covered with a durable fluted black composition. The length closed is 21 ins. The height of the tripod is continuously variable, as

the first and longest movable section can be locked in any position by means of a locking ring. Lasting rigidity, and insurance against the development of shake is secured by the forked joint by which the legs are hinged to the head. For use on hard, slippery surfaces captive non-slip rubber ends are made to slide down over the points by a few turns of a screw motion, thus avoiding the trouble necessitated by the more usual reversing points. A sensitive spirit level is sunk, safe from damage, in the body of the head. The price of the tripod is £5 15s. 0d.



(All formulae have been revised for the present edition).

ORTHOCHROMATIC PROCESSES

Colour Sensitisers.

Sensitol Red and Sensitol Violet both sensitise strongly for red, orange and bright (yellowish) green. Sensitol Green sensitises strongly for the whole of the blue-green, yellow-green, and yellow, and well into the orange-red.

Plates treated with the red or violet dye may be handled by the light of a safe-lamp transmitting only bluish-green light between $\lambda 50$ and $\lambda 52$, but no other light is permissible. Plates treated with Sensitol Green may be handled by a deep ruby light.

A clean working plate, and in the case of Sensitol Violet a slow plate, such as Ilford Ordinary or Empress, should be selected for treatment in order to obtain sensitised plates free from yell.

Stock Solutions.

In making these it is preferable to dissolve the dye first in part of the solvent (heated), and then to dilute to the requisite strength. The Sensitol Red is made up to 1:1000 and the Sensitol Violet up to 1:5000 with alcohol or industrial spirit.

Sensitol Green is also made up to a strength of 1:1000, but a quarter of the solvent, in

which the dye is first dissolved, should preferably be methyl alcohol or wood spirit, the remainder being alcohol or industrial spirit.

All these solutions keep indefinitely in the dark; there is, however, a tendency for Sensitol Red to crystallise out at low temperatures, in which case it should be re-dissolved by careful warming.

Bathing Process.

The actual sensitising baths may be obtained by diluting the stock solutions with water (red and green dyes only) or with spirit.

Aqueous Dye Bath.

Distilled water, 1,000 parts; stock dye solution, 15-20 parts.

Bathe for about 3 minutes, wash well in running water or frequent changes for several minutes, and then dry as quickly as possible in a current of warm dry air free from dust.

Alcohol Dye Bath.

 Red. Green. Violet.

 W
 ...
 500
 500
 500

 S
 ...
 250
 250
 200

 D
 ...
 10
 15
 50

 W
 is distilled water;
 S, industrial spirit;
 D, stock dye

solution.

Bathe for about 3 minutes, and then dry, without washing, in a current of dry air; this must be cool in the case of the Sensitol violet dve.

All the above operations should be conducted in darkness or in a minimum of deep red light (in the case of Sensitol Green) or of bluish-green light (for Sensitol Red or Sensitol Violet).

The aqueous baths gradually deteriorate on keeping.

The alcoholic baths keep in good condition and may be renewed, after use or after long storage, by the addition of a little stock dye solution.

Safelights.

The following formulæ are for safelight screens made by coating glass with gelatine solution containing a dye. They are suitable for use with electric light, but the screens are liable to fade and become unsafe when used as filters of daylight.

Throughout, the gelatine is one of 6 per cent. strength (60 gms. dissolved in 1,000 c.c.s. water). Each dyed solution is applied in the proportion of 7 c.c.s. per 10 square inches of glass.

Each safelight is made by binding together two coloured gelatine-coated glasses film to film, with or without insertion of white tissue or other paper according as direct or diffused light is desired.

Bright Yellow.

For Lantern Plates or Gaslight Papers.

Gelatine solution ... 500 c.c.s. (Naphthol Orange, 4 gms., dissolved in 100 c.c.s. water.)

Orange.

For Bromide Papers.

I.—Gelatine solution 100 c.c.s. Tartrazine ... 0.8 gms. II.—Gelatine solution 100 c.c.s.

Rose Bengal ... 0.3 gm.
(I. and II., bound film to film, form the safelight.)

Red.

For Ordinary and Yellow-Green Sensitive Plates

Gelatine solution ... 500 c.c.s. Dark-Room Red

(Höchst) ... 4.5 gms. (dissolved in 100 c.c.s. water.)

Green.

For Ordinary and Yellow-Green Sensitive Plates.

Gelatine solution ... 500 c.c.s.
Dark-Room Green
(Höchst) ... 4 gms.
(Dissolved in 100 c.c.s. water.)

Dark Red.

Relatively safe for Panchromatic Plates.

Gelatine solution ... 500 c.c.s. Dark-Room Dark Red (Höchst) ... 4.5 gms.

(Dissolved in 100 c.c.s. water.) Dark Green.

For Panchromatic Plates.

Naphthol green 61 grs. (8 gms.) Filter blue soln. $\frac{1}{2}$ oz. (32 c.c.s.)

Gelatine (8%) ... 16 ozs. (1,000 c.c.s.)

The Filter Blue solution is prepared by dissolving 0·1 gm. (0·88 grs.) of filter blue in 1,000 c.c.s. (20 ozs.) of water, and adding 1 c.c. (1 minim) of ammonia. Of the mixed solution allow 7 c.c.s. per 100 sq. cm. (750 minims per 100 sq. ins.)

DESENSITISING.

Pheno-safranine.

Various safranine dves may be used for desensitising before That which is development. mostly used is pheno-safranine. A stock solution may be prepared by dissolving 10 grains of the dve in 41 ounces of water (1 gramme in 200 c.c.s.). For use, 1 part of this solution is added to 9 parts of water. The plate should be immersed in this solution for 2 minutes-a longer immersion will do no harm-and then rinsed and placed in the developer.

Ordinary and orthochromatic plates may be immersed in the desensitising solution by the ordinary darkroom lighting: panchromatic plates must be handled in darkness until after desensitising. Orthochromatic and rapid ordinary plates may be safely developed in a bright orange light or by subdued whitelight. Panchromatic plates still require care in regard to the use of a light for developing. The amount and character of the light used depends on the speed of the plate and the dye used for producing colour sensitiveness. With most a red safelight may be used, while with others a feeble white light is preferable. In any case the direct rays of the light should not be allowed to fall on the plate.

When a plate has been desensitised with pheno-safranine, a hydroquinone developer acts similarly to metol: metol-hydroquinone is almost unaffected: pyro soda and amidol are slightly restrained.

Pinacryptol Green.

Pinacryptol-green is a thoroughly efficient desensitiser for ordinary and colour-sensitive plates. Like pheno-safranine, pinacryptol - green energises hydroquinone, has less effect with either metol-hydroquinone or pyro; it exercises a decided restraining effect on amidol.

A stock solution may be prepared by dissolving 10 grains in 11 ounces of warm water. (1 gm. in 500 c.c.s.). This 1 in 500 solution is diluted for use by taking I part and adding 9 parts of water. The plates are immersed in this solution for 2 minutes, rinsed and placed in the developer. As described for pheno-safranine ordinary red safelight may be used when desensitising rapid ordinary and orthochromatic plates, but panchromatic plates must be kept in total darkness until desensitised.

Pinacryptol Yellow.

For desensitising colour plates, pinacryptol-yellow is preferable to pinacryptol-green as the dilute solution used for desensitising is almost colourless, and it does not stain the plate. For some colour-sensitive plates pinacryptol-yellow is preferable to pinacryptol-green. It should be used as a preliminary bath before development.

The preparation of the stock solution and the dilution for use are the same as described for pinacryptol-green.

NEGATIVE DEVELOPERS.

Weights and Measures.

In all formulæ the metric weights are not equivalents of the British item for item, but each formula gives a solution of the same composition.

One-Solution Developers.

We give the following onesolution developers for thosewho prefer this form, but we do not recommend them. The twosolution form is far preferable, the solutions remain in good working condition for a very much longer time.

Metol.

| Metol | | | 75 grs. |
|------------------|------|--------|------------------------------------|
| Sodium cryst. | | ohite, | (17 gms.) 1½ ozs. (125 gms.) |
| Sodium cryst. | | onate, | 1 ³ ozs. (175 gms.) |
| Potassii mic | | bro- | 8 grs. (1.8 gms.) |
| Water, | to m | ake | 10 ozs. (1,000 c.c.s.) |

See note on page 335 in reference to preparing developing solutions containing metol.

For use take, stock solution, 1 part, water, 2 parts.

This developer tends to give soft and delicate negatives rather than contrast.

Hydroquinone.

| Hydroquinone | 50 grs. |
|------------------|---|
| Sodium sulphite | (11.5 gms.) 1 oz. |
| Sodium carbonate | (100 gms.) 1 oz. |
| Water, to make | (100 gms.) 10 ozs. (1.000 c.c.s.) |

The sulphite should be dissolved first and next the hydroquinone, and last of all the carbonate. This is a slow-acting developer and gives rather strong contrasts. The temperature must not be allowed to fall below 60°F. (15°C), or the developer becomes inert.

For use take 1 part stock solution and one part water.

Metol-Hydroquinone.

| Metol | 10 grs. (2·3 gms.) |
|------------------|---------------------------|
| Hydroquinone | 30 grs. |
| Sodium Sulphite | (7 gms.) 320 grs. |
| Sodium carbonate | (73 gms.) 320 grs. |
| Potassium bro- | (73 gms.) 10 grs. |
| mide | (2·3 gms.) |
| Water, to make | 10 ozs. (1,000 c.c.s.) |

For use take 1 part stock solution and 1 part water. This developer combines the qualities of metol and hydroquinone: it produces the maximum detail with good contrast.

Chlorquinol Metal.

| Metol | 10 grs. |
|----------------------------|-----------------------------------|
| Chlorquinol | (2·3 gms.) 30 grs. |
| Sodium Sulphite, cryst. | (7 gms.) 320 grs. (73 gms.) |
| Sodium carbonate, cryst. | 320 grs. (73 gms.) |
| Potassium bromide | 5 grs. (1·15 gms.) |
| Water, to make | 10 ozs. (1,000 c.c.s.) |
| | |

For use take 1 part stock solution, 1 part water.

This developer is very similar in its action and in the results given, to metol-hydroquinone.

Glycin.

Sodium sulphite, 600 grs. (137 gms.) Glycin 120 grs. (27.5 gms.) Sodium carbonate 600 grs. (137 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

The chemicals should be dissolved in the order in which they stand in the formula.

Dilute, 1 part to 4 parts water for dish development; the time required will be from 6 to 10 minutes according to the contrast in the subject and the type of negative required. For tank development, 1 part to 15 parts water, time 20 to 30 minutes.

This developer has far better keeping qualities than any other single-solution developer.

The image is very clear and clean and has a fine grain.

Amidol.

While amidol is one of the best developers for bromide paper, it is also good for plates when soft and delicate negatives are required. The formula is:—

| Amidol | 30 grs. (7 gms.) |
|-------------------------|--------------------------|
| Sodium sulphite, cryst. | 240 grs. (55 gms.) |
| Potassium bro- mide | 6 grs. (1.4 gms.) |
| Water, to make | 10 ozs. (1,000 c.c.s. |

The sulphite must be dissolved first. This developer should be used either the same day that it is mixed, or on the following day. It will not keep.

Two-Solution Developers.

Pyro-Soda.

B. J. Formula.

- 80 grs. Pyro ... (18.3 gms.) Sodium sulphite, 640 grs. (148 gms.) cryst. Potass. meta-80 grs. bisulphite (18.3 gms.) Potassium bro- 20 grs. (4.6 gms.) mide Water, to make 10 ozs. (1,000 c.c.s.)
- B. Sodium carbonate, cryst. (148 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

In mixing the A solution, the sulphite and metabisulphite should be dissolved first. 40 grains (9 gms.) of citric acid may be substituted for the metabisulphite. For use take A, 1 part; B, 1 part; water 2 parts.

This developer will produce negatives free from pyro stain, and development for 4 minutes at 65 degrees, with full exposure will yield soft negatives full of detail well suited for enlarging. When stronger negatives are required the working solution is prepared by taking A, I part; B, I part and water I part, and developing for 5 to 6 minutes.

Solutions A and B will keep in thoughly good condition for a very long time.

Metol.

A. Metol ... 75 grs. (17 gms.)
Sodium sulphite, 11 ozs. cryst. (125 gms.)
Potassium bro-mide (3 6 gms.)
Water, to make 10 ozs. (1,000 cc.s.)

Sodium carbon- 1½ ozs. (125 gms.) ate, cryst. Water, to make 10 ozs. (1,000 c.c.s.)

We cannot endorse the directions generally given that in preparing developing solutions containing metol, the metol should be dissolved first. If the sulphite is dissolved first and then the metol, the solution has much better keeping qualities. On account of the difficulty frequently experienced in dissolving metol in a strong solution of sulphite, it will be found a good plan to take a small proportion of the sulphite—about one-fifth-dissolve that in water at about 120°F, and then add the metol. When this is dissolved the remainder of the sulphite may be added.

For use, take: A, I part; B, 1 part; Water, 1 part.

Metol gives delicate negatives full of detail but with very little density unless development is greatly prolonged.

Metol-Hydroguinone.

Metol 20 grs. (4.6 gms.) Hydroquinone 60 grs. (14 gms.) Sodium sulphite, 640 grs. cryst. (148 gms.) Potassium bro-20 grs. mide (4.6 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

B. Sodium carbon-640 grs. ate, cryst. (148 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

Refer to note in preceding formula on dissolving metol.

This developer yields negatives similar in strength and gradation to those given by pyro-soda, with absolute immunity from stain coloration even when diluted or the water bath used.

For negatives suitable for enlarging, take A, 1 part: 1 part; water. 2 parts. time Development about 4 minutes. For stronger negatives for contact printing, A, I part: water, 1 part. B, 1 part; Development time, 5 to 6 minutes.

Metol-Chlorquinol.

Metol 20 grs. (4.6 gms.) 60 grs. Chlorquinol ... (14 gms.) Sodium sulphite, 640 grs. (148 gms.) cryst. 20 grs. Potassium bro-(4.6 gms.) mide Water, to make 10 ozs. (1,000 c.c.s.)

B. Sodium carbon-640 grs. ate cryst. (148 gms.) Water, to make 10 ozs.

(1,000 c.c.s.) Refer to note on metol formula

on dissolving metol.

This developer is very similar to metol-hydroquinone, and produces identical results. For negatives suitable for enlarging take A, 1 part; B, 1 part; water, 2 parts; development time about 4 minutes. For stronger negatives, suitable for contact printing, A, 1 part; 1 B, 1 part; water, part. Development time 5 minutes.

Pyro-Metol.

40 grs. Pyro ... (9 gms.) Metol 35 grs. (8 gms.) Potassium meta- 90 grs. bisulphite (20 gms.) Potassium bro-15 grs. mide (3.5 gms.) Water, to make 10 ozs. (1,000 c.c.s.) B. Sodium carbonate ... (150 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

Dissolve the metabisulphite first, then the pyro and when that is dissolved add the metol.

For normal exposures of ordinary subjects, take A, I part; B, I part; water, I part. For under exposed plates increase the water to 4 or even 8 parts and allow longer time. This developer gives both detail and density quickly: the negatives are a pronounced brownish green colour, especially if the developer is diluted. They possess strong printing quality.

Metol-Pyro-Hydroquinone.

B. J. FORMULA.

Metol 20 grs. (4.6 gms.) 30 grs. Pyro ... (7 gms.) 30 grs. Hydroquinone (7 gms.) 640 grs. Soda sulphite (148 gms.) cryst. Citric acid 40 grs. (9 gms.) 20 grs. Potass, bromide (4.6 gms.) Water, to make 10 ozs. (1,000 c.c.s.) Soda carbonate 640 grs. (148 gms.) cryst.

In preparing A solution, one-fifth of the sulphite should be dissolved first, then the metol, the remainder of the sulphite, citric acid, metol, pyro, hydroquinone, potass. bromide. If the pyro is added immediately after the metol, they both dissolve together in a few seconds.

Water, to make 10 ozs.

(1,000 c.c.s.)

For average subjects, take A, 1 part; B, 1 part; water, 2 parts. For softer results

(portraits, etc.), the water may be increased to 4 or 6 parts.

This developer, though nonstaining, combines the qualities of pyro and metol-hydroquinone. Solution A will keep in perfect working condition for a very long time, even if the bottle is frequently opened. If prepared with distilled water it is almost colourless.

Negatives suitable for enlarging are obtained by developing for 4 minutes at 65° F., from average subjects. For stronger negatives, for contact bromide printing, 6 minutes, using A, I part; B, 1, part; water, I part;

Azol.

Normal exposures. Azol l oz. (5 c.c.s.) Water 6 ozs. (120 c.c.s.) Under-exposures. Azol + OZ. (5 c.c.s.) Water 8 ozs. (160 c.c.s.) Over-exposures. 1 oz. Azol (5 c.c.s.) Water 4 ozs. (80 c.c.s.) For stand development:-Azol, 1 part; water, 100 parts. For tank development :--Azol. 3 part; water, 40 parts. Time of development of films at 60 deg. F., 20 to 30 minutes. This solution may be used several times in succession.

Ferrous Oxalate.

A.—Potass. oxalate (neutral), 5 ozs.; hot water, 20 ozs. Cool, and pour off clear liquid.

B.—Warm water, 20 ozs.;

B.—Warm water, 20 ozs.; sulphuric acid, 30 minims; sulphate of iron, 5 ozs.

Mix 1 oz. of B with 3 to 4 ozs. of A (pouring B into A).

Fine Grain Developers.

For work with miniature cameras a developer which produces images of fine grain is essential. In many cases the picture has to be enlarged considerably, and an image of coarse grain would only yield very coarse and unsatisfactory enlargements.

Metol-Hydroquinone Borax.

Kodak D.76: No. 1.

Metol 11 grs. (2.5 gms.) Hydroquinone ... 22 grs. (5 gms.) Sodium sulphite, 2 ozs. (200 gms.) cryst. Borax 9 grs. (2 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

Time of development 9 to 12 minutes.

For softer results the proportions of metol and hydroquinone may be modified as in the following formula.

No. 2.

Metol 9 grs. (2 gms.) Hydroquinone ... 11 grs. (2.5 gms.) Sodium sulphite, 2 ozs. cryst. (200 gms.) Borax ... 9 grs. (2 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

Time of development 9 to 12 minutes.

A modification of the preceding formula is that known as the "Buffered Borax." It will keep for weeks with no appreciable change in its action. It produces negatives with exceptionally fine grain.

| Metol | 9 grs. |
|----------------------------|----------------------|
| Hydroquinone | (2 gms.) 22 grs. |
| | (5 gms.) |
| Sodium sulphite, cryst. | 2 ozs. |
| Borax | (200 gms.) 9 grs. |
| D : | (2 gms.) |
| Boric acid | 64 grs. (14 gms.) |
| Water, to make | 10 ozs. |
| | (1,000 c.c.s.) |

Time of development 18 to 24 minutes.

In all these three formulæ, it is desirable to dissolve a small proportion of the sulphite in about one-half of the water at about 125 degrees, add the metol, then while agitating the solution add the hydroquinone; dissolve the remainder of the sulphite in the rest of the water at about 160 degrees, and when that is dissolved, add the borax and boric acid. The two solutions are then mixed.

Glycin.

The glycin formula on page 331 produces negatives of fine grain, but still finer grain may be obtained by using paraphenylene-diamine either alone or in combination with glycin.

Paraphenylene-Diamine.

The finest grain is given by paraphenylene-diamine with sodium sulphite only, but it requires twice the normal exposure.

The formula is :-

Paraphenylenediamine 45 grs. (10 3 gms.) Sodium sulphite, 525 grs. cryst. (120 gms.) Water, to make 10 ozs. (1,000 c.c.s.) The paraphenylene-diamine should be dissolved in hot water, 160 degrees F, and when thoroughly dissolved the sulphite is added.

Time of development 30 minutes at 65 degrees.

Paraphenylene-Diamine with Tri-basic Sodium Phosphate.

A rather coarser grain than that given by the preceding formula results from the addition of tri-basic sodium phosphate and borax. Normal exposure only is then necessary, and the grain is still fine.

The formula is :-

Paraphenylenediamine 52 grs.
(12 gms.)
Sodium sulphite, 525 grs.
cryst. (120 gms.)
Borax ... (160 grs.
(36 gms.)
Tri-basic sodium
phosphate (30 gms.)
Water, to make 10 ozs.
(1,000 c.c.s.)

The paraphenylene-diamine and sulphite should be dissolved as described in the preceding formula, the borax and tribasic sodium phosphate are then added. This developer does not keep well; it should be used on the day that it is mixed or the following day.

Time of development 35 minutes.

Paraphenylene-Diamine-Glycin.

| Paraphenylene- diamine | 48 grs. (11 gms.) | |
|---------------------------|--------------------------|--|
| Glycin | 5 grs. (1.1 gms.) | |
| Sodium sulphite, cryst. | 480 grs. (110 gms.) | |
| Water, to make | 10 ozs. (1,000 c.c.s. | |

The paraphenylene-diamine and sulphite should be dissolved as described and then the glycin added. Stronger negatives can be obtained by increasing the quantity of glycin to 10 grains, $2 \cdot 2$ grammes.

No increase in exposure is required when using this formula. The time of development is about 20 minutes.

Metol Poisoning.

Metol (among other developers) has a poisoning effect on the skin of many people, causing painful sores and irritation.

The following ointment has a very beneficial effect in such cases:—

Ichthyol ... 10 grs. Lanoline ... 40 grs. Boric acid ... 40 grs. Vaseline... 30 grs.

Apply two or three times a day, and rub in well before retiring for the night.

Metol Staining.

The stains on the skin and finger-nails produced by metol developers may be prevented as follows:—

The fingers are dipped before starting and fairly frequently while developing in:—

Water ... 10 ozs. Hydrochloric acid 10 drops.

The acid stops the action of the developer by neutralising the alkali in the same way that an acid stop-bath does with prints.

If used constantly this bath will also be found to be an effective preventative of metolpoisoning.

Paramidophenol.

A. Paramidophenol 3 oz. hydro-chloride (68 gms.) Water, hot ... 6 to 7 ozs. (600 to 700 c.c.s.)

Filter this solution, if necessary.

B. Soda, sulphite 45 grs. (9.36 gms.) 150 grs. dry (31·2 gms.) Water ... 2 ozs. (200 c.c.s.)

Add B to A. The paramidophenol base is thrown down. When mixture is cool, filter off the deposit on cloth, and let the paste dry until its bulk is not more than 3 ozs. (300 c.c.s.)

Then, in a graduate, mix it with 1 oz. (100 c.c.s.) of soda bisulphite lye 35° B., and add strong solution of caustic soda of 40° B. (about 50 per cent.) until the base is just dissolved. Water is then added to make 5 ozs. (500 c.c.s.). The solution is diluted 20 to 30 times for use.

Two-Solution.

| Α. | Paramido- phenol-hydro- chloride | 200 grs. (23 gms.) |
|----|--|---------------------------|
| | Potass. meta- bisulphite | 100 grs. (11.5 gms.) |
| | Distilled water to make | 20 ozs. (1,000 c.c.s.) |
| | | |

B. Soda sulphite 1½ ozs. (62 gms.)

Potassium carbonate (62 gms.)
1½ ozs. (62 gms.)
1½ ozs. (62 gms.)
12 ozs. (62 gms.)
1,000 c.c.s.)

For use, mix 1 ozs. of A with 2 ozs. of B.

Maximum-Contrast Hydroquinone.

| Α. | Soda bisulphite | 220 grs. |
|----|-----------------|-----------------------|
| | Hydroquinone | (25 gms.) 220 grs. |
| | Potass. bromide | (25 gms.) 220 grs. |
| | Water, to make | (25 gms.) 20 ozs. |
| | | (1,000 c.c. |

B. Caustic soda 394 grs. (45 gms.)

Water, to make 20 ozs. (1,000 c.c.s.)

For use, mix A and B in equal parts.

Maximum Energy Developer.

(Kodak D-82.)

Recommended for underexposures.

| Water (about 125°F.) | | 24 ozs. |
|----------------------|-------|--------------------------------|
| Wood alcohol | | (750 c.c.s.) 1½ ozs. |
| Metol | | (48 c.c.s.) 200 grs. |
| Sodium sulph | ite | (14 gms.) 13 ozs. |
| (anhydrous) | | (52·5 gms.) |
| or crystallise | | $3\frac{1}{2}$ ozs. (105 gms.) |
| Hydroquinone | ••• | 200 grs. (14 gms.) |
| Caustic Soda | | 125 grs. |
| Potass. bromic | le | (8.8 gms.) 125 grs. |
| Cold water to |) = · | (8·8 gms.) 32 ozs. |
| make | | (1,000 c.c.s.) |

Develop from 4 to 5 minutes at 65° F. (18° C.).

Physical Development for Fine Grain.

(Odell's formulæ.)

Two processes have been worked out. In Process No. 1 the plate or film is developed in a solution containing hypo, soda sulphite, silver nitrate and

amidol. For this process the plate or film requires to be given an exposure exactly five times that which is correct for ordinary development. Development lasts about 1½ hours.

In Process No. 2, the plate is first put in a bath of soda sulphite and potass. iodide for 1½ minutes and then developed in the same solution as used in Process No. 1. With this process exposures do not require to be longer than for ordinary development.

PROCESS No. 1. Stock Solution.

Hypo 3½ ozs. (175 gms.)

Sodium sulphite, anyhdrous (62-5 gms.)

Silver nitrate, cryst. 150 grs. (17 gms.)

Water, to make ... 20 ozs. (1,000 c.c.s.)

It is best to use distilled water for this solution, but not absolutely essential.

The order and method of mixing is very important. Dissolve the hypo and the sulphite in 12 ounces of water. Dissolve the silver nitrate in the remaining 8 ounces of water; then add the silver solution to the solution of hypo and sulphite slowly, stirring vigorously with a glass rod during the whole of the addition.

If the method of addition is accidentally reversed, silver thiosulphate will precipitate and promptly decompose into silver sulphide, thus being lost. The mixing is best carried out in subdued daylight and the combining of the two solutions done so slowly that the precipitate which forms is immediately dissolved on stirring.

The solution is quite stable and will keep indefinitely in the light in any bottle. If a cloudiness persists, due to impurities in the water, it may be necessary to filter it. If a slight black precipitate forms, this is probably due to impurities in the hypo, and as it settles it does no harm to the bath.

Mix:-

A. Stock solution 1 oz. (100 c.c.s.)

Water ... 1 oz. (100 c.c.s.)

In a separate graduate, dissolve:

Mix A and B,

Physical development of plates or films must be carried out with the material lying flat in the tray. Tank development, i.e., with the negatives standing on edge, is not possible.

For negatives physically developed in this formula, the exposure must be exactly five-times normal.

The exposed negatives are placed in the freshly-prepared developer, and the surface of each plate or film wiped gently with the ball of the finger, preferably with a rubber cap on it. This ensures thorough wetting of the emulsion surface and the avoidance of pin-holes, which latter seem to occur more in physical development than in chemical development. The dish is then covered and allowed to stand for one and one-half hours at 65 to 70° F.

The development is greatest in the first hour. At the end of the 1½ hours, development

should be complete. The operation is performed in the darkroom, and, still in the darkroom the negatives are removed, slightly rinsed, and placed in a tray containing ordinary acid fixing and hardening solution. They will appear to be cleared in the developer but they are not fixed. The hardener in the fixing bath toughens the film so that loose silver deposited on the surface may be wiped off with a bit of cotton. The fixing required is not long-a matter of a few minutes-after which the surface is again swabbed with cotton, and the negatives washed and dried as usual.

Exposure to light before fixing may result in partial reversal and brown stains and the solutions given are best used only once for a single set of negatives.

> PROCESS No. 2. Fore-Bath.

Potassium iodide ... 94 grs. (10.5 gms.) Sodium sulphite, 238 grs. anhydrous (25.2 gms.) Water, to make ... 20 ozs. (1,000 c.c.s.)

The normally-exposed negative is placed in this fore-bath for exactly one and one-half minutes, removed and rinsed slightly, and then placed in the physical developing bath as described in Process No. 1.

The same precautions are observed as in Process No. 1 throughout, and after 45 minutes the negatives are examined. The negatives appear very different from those made by Process No. 1. The silver The silver bromide in the emulsion has

been changed largely to silver iodide, and the negatives do not clear up, but rather they have a white and very opaque appearin the undeveloped portions. This condition requires longer fixation in the ordinary acid hypo bath (from 15 to 20 minutes) due to the slow solubility of the silver iodide. The fixation will be fully equal to, if not longer, than the usual fixing time in chemical development. The final washing should be about two hours in running water.

All dishes used for physical development must be chemically clean. Any dirt is fatal.

Film Quantity Developer.

The following metol-hydroquinone-pyro formula of the Kodak Co., is known as D75 and is for tank development of rollfilm, etc., in about 10 minutes.

In making up 10 gallons of developer, 2 gallons of water are placed in the tank, Sol'n No. 1 added, then Sol'n No. 2, then No. 3 and No. 4-with thorough stirring after adding Finally add water to each. make 10 gallons, again with thorough stirring.

Solution No. 1.

Water (125° F.) ... 1 gall. Elon (Metol) 1½ ozs.

Solution No. 2

Water (125° F.) ... 1 gall. Soda sulphite, cryst. 1 lb. Sodium bisulphite 15 ozs.

Solution No. 3. Water (160° F.) ... 1 gall. Soda sulphite, cryst. 14 ozs. Hydroquinone ... 5 ozs. Pyro 11 ozs. ...

Solution No. 4.

Water (125° F.) ... 1 gall. Soda carbonate, 5 lbs. cryst.

The developer should be kept at 68° F., never below 65° nor above 70°. For each degree above or below 68° allow one minute less or more in time of development. Time at 68° is 10 minutes.

For strengthening developer after use, a stock solution is kept at hand, viz.:—

 Water (125° F.)
 1 gall.

 Elon (Metol)
 1½ czs.

 Soda sulphite, cryst.
 15 ozs.

 Soda bisulphite
 7½ ozs.

 Hydroquinone
 2½ ozs.

 Soda carbonate, cryst.
 3 lbs.

 cryst.
 6 ozs.

 Water, to make
 2 galls.

A portion of this stock is mixed with an equal bulk of water before adding to the solution in the tank. Enough of this (diluted) solution is added to bring the tank developer back to its original volume.

Capacity of Tanks.

One cubic inch equals about 278 minims (16.4 c.c.s.), equal to .58 oz. or .0036 gallon (Imperial). Therefore the capacity of a tank can be ascertained by measuring the width, breadth and depth in inches, multiplying the three figures together. This gives the capacity in cubic inches. To find the capacity in ozs., multiply by 4 and divide by 7. To find the capacity in gallons, divide by 280.

Developer-Fixer.

Ferrotypes.

Hydroquinone ... 205 grs. (22.6 gms.) Soda sulphite, cryst. 13 ozs. (87 gms.) Soda carbonate. 11 ozs. (62 · 5 gms.) cryst. Hypo 3% ozs. (187 gms.) Liq. ammonia, .880 12½ drams (78 c.c.s.) 20 ozs. Water, to make ... (1,000 c.c.s.)

The plates develop and fix in one minute and are then simply rinsed in water.

FIXING, WASHING & DRYING.

Hypo Fixing Bath.

The average strength of hypo for fixing negatives is 4 ozs. per 20 ozs. (200 gms. litre). It should not be less, but may be more—5, 6 or 8 ozs.

A convenient method of keeping hypo is: dissolve each pound (500 gms.) in about 20 ozs. (600 c.c.s.) of water (hot), cool and make up to 32 ozs. (1 litre) in all. Every 2 ozs. of this stock solution equals 1 oz. hypo, It is used as

follows to make up baths of various strengths:—

Col. 1.

8 ozs. (40%) Stock, 4; water, 1. 6 ozs. (30%) Stock, 3; water, 2. 5 ozs. (25%) Equal parts. 4 ozs. (20%) Stock, 2; water, 3. 3 ozs. (15%) Stock, 2; water, 7. 2 ozs. (10%) Stock, 1; water, 4.

To make fixer containing (per 20 ozs.) any of the quantities of hypo named in Col. 1, mix the stock solution with water in the proportion stated

on right, e.g., for a fixer of 4 ozs. hypo, mix 2 parts of stock with 3 parts of water.

In fixing plates or films, three rules should invariably be observed:—

1. Let plates remain in fixer as long again as it takes for the white emulsion to dissolve away.

2. Always rinse fingers under tap or in a dish of water after touching hypo, not simply wipe on a towel.

3. Avoid lefting hypo droppings dry up on table or floor. If hypo solution drops or is splashed or spilt, mop it up and leave all clean.

Acid Fixing Baths.

 Hypo
 ...
 4 to 6 ozs.

 (200 to 300 gms.)
 $\frac{1}{2}$ oz.

 sulphite
 (25 gms.)

 Water, to make
 20 ozs.

 (1,000 c.c.s.)

Metabisulphite should not be added to hot hypo solution.

This is the best formula we know for an acid fixing bath for plates or papers. It keeps clear and stainless to the last, and does not throw down sulphur with use.

Extra-rapid Fixing.

Hypo 4 ozs.
(200 gms.)

† to 1 oz.
(25 to 50 gms.)

Water, to make 20 ozs.
(1,000 c.c.s.)

The ammonium chloride is the commercial sal ammoniac as used for batteries. The bath fixes in about half the usual time but is not recommended for regular use.

Hardening-Fixing Baths.

No. 1.

A. Hypo ... 5 czs. (250 gms.)

Water, to make 20 czs. (1,000 c.c.s.)

B. Soda sulphite, cryst. 4 ozs. (200 gms.)

Acetic acid 3 ozs. (fl.)

glacial (150 c.c.s.)

Alum ... 2 ozs. (100 gms.)

Water (warm), 20 ozs. to make (1,000 c.c.s.)

To make the fixing-hardening bath, 2 parts of the B (hardener-solution) are added to 20 parts of the A (hypo) solution.

No. 2.

Hypo 8 ozs. (400 gms.)

Potass. metabi- 120 grs. (12.5 gms.)

Water, to make 20 ozs. (1,000 c.c.s.)

To this add :-

Chrome alum ... 240 grs. (27 gms.)
Water ... 20 ozs. (1,000 c.c.s.)

No. 3.

Hypo ... 5½ ozs. (275 gms.)
Sodium acetate 230 grs. (27 gms.)
Chrome alum ... 70 grains (8 gms.)
Water, to make 20 ozs. (1,000 c.c.s.)

Dissolve hypo in 16/18 ozs. of water, and add the sodium acetate. When this is in solution, add the chrome alum previously dissolved in the balance of the water.

In compounding all hardeningfixing baths, alum should be dissolved by itself in water; the sulphite likewise, and any acid

For Extra Hardening.

For use at temperatures up to 95° F. (35° C.), the following fixing bath may be used. It is well to make it up fresh each week.

Hypo ... 5 ozs.

Dissolve the hypo first, then the sulphite, and finally add the formaline.

Hypo-Eliminator.

Wash the negative for one minute under the tap, and transfer to a shallow dish containing very weak (clear pink) potass. permanganate solution.

Remove the negative as soon as the colour goes (which will be in a second or two if hypo is present), and keep on treating in the very weak permanganate baths until the colour is not quickly discharged.

The water itself will destroy the permanganate colour, but not quickly as hypo does.

The above is a satisfactory process which allows of a negative being ready for drying within three minutes of fixation.

Rapid Drying.

Method I.—Rinse from the hypo-bath, place in 1:50 formaline for ten minutes, wash by pouring nearly boiling water six times over the negative and dry by heat. To get rid of the relief which is produced by this process, the negative is rubbed with a piece of washleather moistened with alcohol.

Method II.—Soak in two successive baths of methylated spirit, and place in a current of air. Ordinary commercial spirit, owing to the mineral naptha in it, causes a whitish soum on the surface of the film, and is not favourable to clean work.

HARDENING AND CLEARING.

Hardening Baths.

- 1. Formaline(40%) 1 oz. fluid. (50 c.c.s.)
 Water, to make 10 to 20 ozs. (500-1,000 c.c.s.)
- 2, Alum... 1 oz. (50 gms.) Water, to make 20 ozs. (1,000 c.c.s.)
- 3. Chrome alum 1 oz. (50 gms.)

 Water, to make 20 ozs. 1,000 c.c.s.)

Whichever bath is used, allow it to act for 15 or 20 minutes.

In making up the chrome alum bath, use cold or warm, not hot water.

Clearing Solutions.

ACID ALUM.

Alum ... 1 oz. (50 gms.)

Citric acid ... ½ oz. (25 gms.)

Water, to make 20 ozs. (1,000 c.č.s.)

Wash well after fixing, and immerse the negative in the above. This bath is also useful for removing white scum from negatives developed with ferrous oxalate if rubbed on with cotton wool.

CHROME ALUM.

- 1. Chrome alum ½ oz. (25 gms.)

 Hydrochloric ½ oz. (25 c.c.s.)

 acid (25 c.c.s.)

 Water, to make 20 ozs. (1,000 c.c.s.)

 2. Citric acid ... 1 oz. (50 gms.)
 - Water, to make 20 ozs. (1,000 c.c.s.)

We prefer bath No. 2 for obtaining a clean smooth film.

Stain Removers.

ALUM-IRON.

The following solution acts on the yellowish stain in a pyro-developed negative, and yields a negative of much quicker printing quality. The solution is slow in action, requiring about 20 minutes.

| Alum | 1 oz. |
|------------------|---------------------------------------|
| Ferrous sulphate | (50 gms.) 3 ozs. |
| Citric acid | (150 gms.) 1 oz. |
| Water, to make | (50 gms.) 20 ozs. (1,000 c.c.s. |

In place of the citric acid half a dram of strong sulphuric acid can be used.

THIOCARBAMIDE.

| Thiocarbamide | 90 grs. |
|----------------|--------------------------|
| | (10·2 gms.) |
| Citric acid | . 90 grs. (10·2 gms.) |
| Water, to make | 20 ozs. |
| | (1,000 c.c.s. |

SODIUM HYPOCHLORITE. (Eau de Javelle.)

This bath need only be resorted to in cases of severe stain, particularly on old negatives.

Bleaching powder 1 oz.
(30 gms.)
Sodium carbonate, cryst.
(45 gms.)

Shake up the bleaching powder with a solution of the carbonate in a little water (6 ozs. of 180 c.c.s.), and filter. Stir up the residue with plain water, and again filter. The filtrate (solution of sodium hypochlorite) forms an active stain remover. It can be acidified with oxalic acid, and then discharges yellow stain still more vigorously, but with risk to the silver image.

N.B.—In either state (alkaline or acid) the solution has a strong softening action on gelatine. Negatives should not be left to soak longer than necessary (10 to 15 minutes) and should be carefully watched while in the reducer.

Bleach and Re-Developer. (Ilford Formula.)

For negatives which are very heavily stained by developer the following method of the Ilford Co. is often the only one which will entirely remove the stain. The negative is treated in a solution which simultaneously removes the stain and bleaches the silver image. This solution is:—

| Potassium per- | 50 grs. |
|----------------|--------------|
| manganate | (5.5 gms.) |
| Common salt | doz. |
| | (12·5 gms.) |
| Acetic acid | 1 oz. |
| (glacial) | (50 c.c.s.) |
| Water, to make | 20 ozs. |
| | (1,000 c.c.s |

If the negative is one freshly made, it is as well to pass it through a weak bath of chrome alum (about 50 grains in 10 ounces of water, *i.e.*, 10.4 gms. per litre) before applying the bleacher.

The bleacher is allowed to act for ten minutes, rocking all the time. It cannot harm the gradations of the negative, and this full time makes sure of the removal of the stain, and avoids a repetition of the process. After a brief rinse, the negative is left in a solution of potass. metabisulphite (1 ounce in 20 ounces of water) until white everywhere to the back of the film, and is then re-developed in any non-staining developer.

Silver Stains.

Most silver stains (due to dampness of paper or negative while the two are in contact) will readily yield to the following simple treatment.

Rub the stains on the dry negative with a tuft of cotton wool or a piece of rag thoroughly moistened with methylated spirit. A fairly firm pressure must be used, care being taken to avoid scratching the film. Then place negative in very strong hypo solution. Here the stain disappears; the time may be minutes or hours according to the depth and age of the stain.

In very severe cases the following method may be necessary:—

Soak the negative in :-

A. Potass. iodide 400 grs. (45 gms.)

Water ... 20 ozs. (1,000 c.c.s.)

and after washing transfer to-

B. Potass. cyanide 600 grs. (67.5 grs.)
Water ... 20 ozs. (1,000 c.c.s.)

in which rub the stained part of the film with a pledget of cotton wool.

If the stain does not yield to this treatment a solution of iodine (in potass, iodide) may be used in place of solution A, but it must be handled with very great care, since the iodine acts more powerfully and it is not at all an easy matter to remove the silver stain without affecting the silver image.

NEGATIVE INTENSIFIERS.

Negatives which are too thin (and as a rule yield flat prints) may be greatly improved by intensification.

The plate should be thoroughly fixed and preferably well washed, but perfect fixation is imperative. Staining and other defects arise from imperfect fixing, not from insufficient washing.

If the plate is too thin, either through under-development or want of contrast in the subject, either the chromium or mercury intensifiers will give excellent results. Mercury, with alkaline development, may be applied several times in succession, if necessary, and a thin image strengthened to any desired extent.

If the plate is over-exposed, veiled and flat, giving a print of insufficient contrast, it should be reduced first with hypo and ferricyanide, and then after washing, intensified as suggested in the preceding paragraph. When a plate is intensified two or more times in succession, or reduced and intensified, it is desirable, whenever practicable, to dry it after each operation.

The copper and lead intensifiers give great density, and are suited only for negatives of line drawings, etc., in which great general capacity and, at the same time, great clearness of the lines are required.

Intensification With Mercury.

MERCURIC CHLORIDE.

The negative is immersed in the following solution of mercuric chloride until the image is thoroughly bleached. This must be determined by examining the plate from the back. The solution can be used several times in succession until exhausted.

Mercuric chloride 120 grs. (27.5 gms.)
Water 10 ozs.

Very hot water should be used for dissolving the mercuric salt, and the solution used when thoroughly cool. It will keep indefinitely, even after being used.

When thoroughly bleached the plate should be washed for a few minutes and then given two or three acid baths, with rinsing between each.

Hydrochloric acid 30 minims. (10 c.c.s.)

Water 12 ozs. (1,000 c.c.s.)

The object of this acid treatment is to prevent an undesirable combination between the mercury and the gelatine film. After the acid baths the plate should be washed for a few minutes and the image blackened in either of the following solutions:—

A. Any non-staining alkaline developer, metol-hydroquinone, amidol, etc. This gives a moderate degree of intensification, sufficient for all ordinary cases that are likely to occur in the work of a careful photographer. The process can, however, be repeated as many times as desired. This is a valuable quality in cases of very difficult subjects where sufficient strength

In this intensifier all tones in the scale are strengthened in equal proportion.

B. Sodium sulphite, 10% solution. This strengthens the negative very slightly. Repetition of the process gives no increase in contrast, but a plate bleached in mercuric chloride and blackened in sodium sulphite can be re-bleached and re-developed and an increase of density obtained equal to that given by mercury and development.

C. The ferrous oxalate developer may be used, but it possesses no advantage over alkaline development, and it gives identical results.

Mercuric Iodide.

Edwards's formula modified by W. B. Shaw.

One of the best general-purpose intensifiers, as the action takes place in one operation, and can be seen and stopped at any stage.

| Mercurio | ciodide | | 90 grs. |
|----------|---------|-----|--|
| Potass. | iodide | | (20 gms.) 90 grs. |
| Нуро | | | (20 gms.) 90 grs. |
| Water | ••• | ••• | (20 gms.) 10 ozs. (1,000 c.c.s.) |
| | | | (1,000 c.c.s.) |

Dissolve ingredients together in a very little water and dilute to the full amount afterwards.

to the full amount afterwards.

The solution keeps well in the dark but soon spoils in the light.

For more gradual intensification, 1 part of the above solution may be mixed with 1 part of water.

The negative should be washed for 5 minutes on removal from the fixing bath before

intensifying and for 15 minutes after intensification.

If required, the intensification may be entirely removed in a 40 per cent. solution of hypo.

Negatives intensified as above are not fully permanent but may be made so by treating in a 1 per cent. solution of soda sulphide until the image has been wholly changed—when viewed from the back—from grey to brownblack. Negatives so treated cannot be reduced with hypo solution.

Lumière Formula.

| Sodium | sulphite | 4 ozs. |
|----------|----------|----------------|
| cryst. | • | (182 gms.) |
| Mercuric | iodide | 90 grs. |
| | | (9·4 gms.) |
| Water | , | 20 ozs. |
| | | (1.000 c.c.s.) |

The sulphite must be dissolved first. The solution keeps well in the dark.

This is a very convenient intensifier, as plates need only be rinsed for a few minutes in water on coming out of the hypo bath to be ready for intensification.

When intensified they are simply washed for a few minutes; the negative is then liable to yellow in time, but if the negative is placed for a few minutes in any non-staining developer the results are quite permanent.

If mercuric iodide is not available the following may be used:—

Mercuric chloride 50 grs. (11.5 gms.)
Water, to make 10 ozs. (1,000 c.c.s.)

Add 10 per cent. potass. iodide solution until precipitate first

formed is redissolved. About 1½ oz. (160 c.c.s.) will be required and when clear add—

Sodium sulphite, 2 ozs. (200 gms.)
Water, to make 10 ozs. (1,000 c.c.s.)

Intensification with Chromium.

An excellent and convenient method of intensification consists in bleaching the image in an acidified solution of potassium bichromate and then re-developing.

Two stock solutions are prepared, each of which will keep indefinitely. The working solution must be prepared at the time of using as it deteriorates rapidly.

The stock solutions are :-

A. Potassium 240 grs. (50 gms.)
Water ... 10 ozs.

B. Hydrochloric ...1 oz. fl.
acid ... (100 c.c.s.)
Water, to make 10 ozs.
(1,000 c.c.s.)

The degree of strengthening varies according to the proportions in which solutions A and B are mixed. Three good standard strengths are the following:—

Bleaching Baths.

No. 1 No. 2 No. 3

A 1 part 1 part 1 part

B ½ ,, 1 ,, 4 parts

Water, 6 parts 6 parts 6 ,,

The plate is immersed in No. 1, 2 or 3 until the image is thoroughly bleached, washed until the yellow bichromate stain is thoroughly removed, and then re-developed with any

non-staining developer. Development should be carried out in white light, either artificial or diffused daylight.

Chromium Intensifiers.

No. 1. gives intensification about equal to mercury and development; No. 2, intermediate between Nos. 1 and 3 and No. 3, equal to mercury and sodium sulphite.

The process may be safely applied after fixation if the plate is simply washed for 10 minutes.

The No. 3 formula for the chromium intensifier, namely, that giving the least intensification, is a very useful means of improving bromide prints which are a trifle weak and particularly which are of poor colour. The redeveloped black image is usually a finer black than can be obtained by direct development.

Silver Intensifiers.

ACID SILVER.

A. Pyro ... 30 grs.

Citric acid ... 30 grs.

(3.12 gms.)
10-20 grs.
(1.2 gms.)
20 ozs.

B. Silver nitrate ... (1,000 c.c.s.) 200 grs. (20.8 grs.) 20 ozs. (1,000 c.c.s.)

About 1 oz. (35 c.c.s.) of A is poured over the plate once or twice, about 15 drops of B solution added, and the mixture again applied. Intensification now takes place, and the solution is poured off and on until sufficient. If intensifier becomes very thick and turbid,

fresh should be mixed up. When dense enough the negative is rinsed, fixed and washed. Negatives (on gelatine plates) are best hardened with alum or formaline before using this intensifier, otherwise it is difficult to avoid stains.

Wellington's Formula.

First harden the film in :-Formaline, 1 part; water, 10 parts, for five minutes. Rinse for a few minutes, and then place for exactly one minute in :---

Potass, ferricyanide 20 grs. (2.08 gms.) Potass. bromide 20 grs. (2.08 gms.) Water, to make 20 ozs. (1,000 c.c.s.)

This causes no apparent change in the negative; if used too long it will bleach the negative and alter its gradation. Rinse again for a few minutes and intensify.

Stock Solutions.

A. Silver nitrate ... 400 grs. (91.5 gms.) Water (distilled), 10 ozs. (1,000 c.c.s.) to make

B. Amm. sulpho-700 grs. (160 gms.) cyanide Hypo 700 grs. (160 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

Take A, $\frac{1}{2}$ oz. (100 c.c.s.), and add slowly to \(\frac{1}{2}\) oz. B (100 c.c.s.), stirring vigorously (mixture should be clear); then add 10% pyro solution (preserved with sulphite), 1 dram (25 c.c.s.), and 10% ammonia solution, 2 drams (50 c.c.s.).

Place negative in chemically clean dish, best of glass, and pour solution over it. Silver begins to deposit in a minute. or two. When intensified enough, place in acid fixer and wash well. Flat negatives may be over-intensified, and then treated with Farmer's reducer.

Copper Intensifier.

Gives great intensification and is best suited for line subjects.

A. Copper sulphate 100 grs. (23 gms.) Water, to make 1 oz. (100 c.c.s.)

B. Potass. bromide 100 grs. (23 gms.) Water, to make 1 oz. (100 c.c.s.)

A and B are separately made up with hot water, mixed, and allowed to cool. The negative is bleached in the mixture, and washed for a minute or two. It is then blackened in :--

Silver nitrate 45 grs. (10.5 gins.) Water (distilled), 1 oz. (100 c.c.s.) to make

For still greater density the negative is well washed from silver and an ordinary developer applied.

If too dense, after the silver, it can be placed in weak hypo solution (about 10 grs. per oz.-(2.3 gms. per 100 c.c.s.) or weak potass. cyanide (about 2 grs. per oz .- · 45 gms. per 100 c.c.s.).

Lead Intensifier.

The lead intensifier gives very great intensification, and is suited only for line subjects.

 Lead nitrate
 ...
 400 grs. (41.6 gms.)

 Potass. ferricy anide
 ...
 600 grs. (62.4 gms.)

 Acetic acid
 ...
 3 drachms (18.8 c.c.s.)

 Water, to make
 20 ozs. (1,000 c.c.s.)

This stock solution will keep for a long time in the dark. The negative is bleached in it, washed once very carefully in 10 per cent. nitric acid—the acid makes the film very tender—then in water, and then darkened in:—

A. Sodium sulphite 1 oz. (45.5 gms.) Water, to make or in— 20 ozs. (1,000 c.c.s.)

B. Schlippe's 90 grs. (9·36 gm.)

Ammonia 6 drachms (0·880) (37·5 c.c.s.)

Water, to make 20 ozs. (1,000 c.c.s.)

C. Potass. 2 ozs. (91 gms.)
Ammonia 1 oz. (50 c.c.s.)
Water, to make 20 ozs. (1,000 c.c.s.)

Any of the above darkening solutions gives great intensification.

Callier Formula

This formula is specially suitable for gelatine plates.

Potassium ferricyanide (37.5 gms.)
Lead nitrate ... 520 grs.
(54.1 gms.)
Acetic acid, 3 drms.
glacial ... (18.7 c.c.s.)
Water, to make 20 ozs.
(1,000 c.c.s.)

The negative is bleached in the above and then passed through three or four baths of:—Hydrochloric acid, $4\frac{3}{4}$ drams (30 c.c.s.); water, 20 ozs. (1,000 c.c.s.), remaining in each for about 5 minutes. Then wash until image is white and darken in weak solution of ammonium sulphide.

Copper Intensifier for Weak Negatives.

An intensifier suitable for dealing with ghosts of images is the following, due to M. G. Zelger of the Pathé-Cinema Laboratories. The negative is bleached in a mixture of 2 parts of A and 1 part of B.

A. Copper sulphate (10.5 gms.) Acetic acid, glacial (56 c.c.s.) Water, to make (10.5 gms.) (10.5 gms.) (10.5 c.c.s.) (10.00 c.c.s.)

B. Potass, iodide 90 grs, (20 · 5 gms.)

Ammonia (22° 1½ ozs.

Baumé) (175 c.c.s.)

Water, to make 10 ozs. (1,000 c.c.s.)

Negative bleaches to a yellowish colour and is then washed for about 20 minutes in running water. It is then darkened with:—Silver nitrate, 22 grs. (2·3 gms.); sodium acetate, 90 grs. (9·36 gms.); water, 20 ozs. (1,000 c.c.s.). To avoid stain, it is well to treat the negative with a solution of alum before using the darkening bath.

NEGATIVE REDUCERS.

It should be recognised that all reducing processes, excepting the rehalogenisation method, are progressive, *i.e.*, the operation can be stopped at any stage by judgment of the effect produced. At any future time reduction canbe resumed, continuing exactly as if taken to a later stage at first.

Reduction is useful if the negative is so dense (black) that it takes long to print. Also, apart from reducing time of printing, reduction is used to improve the gradation of

negatives.

For those which are too hard, usually as the result of under-exposure and too long development, the best reducer is the "proportionate" one of permanganate and persulphate.

For those which, though dense, yield prints which are too flat—this is the result of great over-exposure and long development—the best is Farmer's. Belitski's is similar.

Even when density is not excessive, it is usually well, in the case of flat negatives, to reduce a little in "Farmer's,"

and then intensify.

The other reducers—Eder's and iodine-cyanide—are used chiefly when it is desired to carry out a little reduction of negatives of good gradation.

Howard Farmer's.

This reducer produces a greater effect on the shadow detail or weak deposits than on the dense parts of a negative. For this reason, it tends to

increase rather than decrease contrast while reducing the actual density.

Two solutions are required:

A. Hypo about $2\frac{1}{2}$ oz. (125 gms.) Water ... 20 ozs. (1,000 c.c.s.) B. Potassium

Ferricyanide 1 oz. (100 gms.)
Water ... 10 ozs. (1,000 c.c.s.)

The working solution is prepared by adding from 25 to 60 minims of B to each ounce of A (5 to 12 c.c.s. B to 100 c.c.s. A) The larger the quantity of B the more rapid is the action but beyond this there is practically no difference. addition of B to A must only be made at the moment of using. as the mixed solution deteriorates very rapidly: it is quite useless in a few minutes. should be lemon-yellow: if it acquires a blue-green tint in use it should be thrown away and fresh solution substituted. It must never be used for two or more negatives in succession.

Belitski's.

Potass, ferric oxalate (48 gms.)

Sodium sulphite, cryst. (40 gms.)

Water, to make 10 ozs. (1,000 c.c.s.)

Dissolve and add:—
Oxalic acid 50 to 65 grs.
(12 to 15 grs.)

and shake until the solution turns green. Then pour off from undissolved crystals and add:— Hypo ... $2\frac{1}{2}$ ozs. (250 gms.)

This reducer is stainless, and keeps well in the dark. Its action on the shadow detail of the negatives is similar to that of Farmer's. It varies somewhat with the strength of the solution.

Instead of the ferric oxalate the following more easily obtainable chemicals can be used in the formula:—

Ferric chloride ... 142 grs. (32.5 gms.)
Potass. oxalate ... 272 grs. (62.5 gms.)

Proportionate Reducer.

A mixed reducer of permanganate and persulphate, originally suggested by N. C. Deck, is found to act proportionately on the densities of a negative, thus reducing contrast. The following formula is that worked out by Kenneth Huse and Adolph H. Nietz, of the Eastman Research Laboratory.

A. Potass. permanganate (0.25 gm.) Sulphuric acid 65 minims (15 c.c.s.) Water, to make 10 ozs.

(1,000 c.c.s.)
The sulphric acid is a 10 per cent. solution by volume of the 1.84 strong acid.

B. Ammonium 110 grs. (25 gms.)
Water, to make 10 ozs.

These stock solutions keep well separately; they are mixed together at the time of use in the proportion of 1 volume of A to 3 volumes of B to form the working reducer. Reduction takes from 1 to 3 minutes.

After reduction, soak the negative for 5 minutes in a solution of 90 grs. (10 gms.) potass.

metabisulphite in 20 ozs. (1,000 c.c.s.) of water, and then wash for a short time.

Persulphate.

The persulphate reducer acts first on the heavy high-light densities of the negatives, reducing these without affecting shadow detail. It thus "softens" a hard negative.

Ammonium persulphate (22 to 45 gms.)
Water ... 10 ozs. (1,000 c.c.s.)

A fresh solution is made at time of use. A drop of sulphuric acid per 2 ozs. (60 c.c.s.) makes the action more regular. A contributor, Mr. A. H. Hall, recommends the following method of using it as infallible. Dry the negative, wet it well, give it a rinse in hypo-eliminator, wash for a few minutes. Make up fresh persulphate solution in water previously acidulated with a drop or two of sulphuric acid, pour on the reducer and rock the whole time. the milky deposit begins to appear, note the time and continue for 20-30 seconds. for slight reduction, increasing the time for heavier reduction.

If no action is seen in two minutes, throw the solution away, wash the negative, and repeat. If much reduction is required—when the solution appears opalescent, throw it away and pour on fresh.

H. W. Bennett's Formula.

Ammonium persulphate ... (55 gms.)

Sodium sulphite, 90 grs.
cryst. ... (11 gms.)

Sulphuric acid 1 oz.
(10% sol'n) (50 c.c.s.)

Water, to make ... 20 ozs.
(1,000 c.c.s.)

This is a stock solution which will keep in good working condition for a long time. For use, equal parts of the stock solution and water should be mixed.

It is essential that the plate to be reduced should be soaked in water for at least an hour before reduction is commenced. Reduction should not be continued after the solution becomes slightly milky.

As soon as the negative is sufficiently reduced, it should be rinsed rapidly and placed for one minute—not longer—in a weak hypo bath (1 oz. of hypo to 20 ozs. (50 gms. in 1,000 c.c.s.)) and then washed.

Iodine-Cyanide.

A very clean-acting (but intensely poisonous) reducer. Very suitable, when used with the further addition of water, for bromide prints, as it leaves no stain.

Iodine (10%sol.) 300 minims (60 c.c.s.)

Pottas. cyanide solution ... (10 c.c.s.)

Water, to make 10 ozs.

To make the iodine solution mix about 150 grs. (35 gms.) potass. iodide with just enough water to dissolve it, add 44 grs. (10 gms.) iodine flakes, which will dissolve in an instant on stirring, and add water to make 1 fluid oz. (100 c.c.s.).

The cyanide solution is one of 10 per cent, strength.

Permanganate.

Potass. permanganate, sol'n (12 c.c.s.)
Sulphuric acid ... 10 drs.
solution ... (60 e.c.s.)
Water, to make 20 ozs.
(1,000 c.c.s.)

The permanganate is 5 per cent. solution. The sulphuric acid is a 10 per cent. solution by volume of the 1.84 strong acid.

Applied to a wet negative, gives even reduction. A dry negative receives greater reduction in the high lights. Any brown stains are removed with a 10 per cent. solution of sodium sulphite containing 2 per cent. oxalic acid.

Reducing Harsh Negatives.

A very valuable and safe method of reducing harsh negatives consists in re-halogenising and re-developing.

The negative is first bleached in a solution consisting of 1 part of a 5 per cent, solution of potassium bichromate, I part of a 10 per cent, solution of hydrochloric acid and 6 parts of water. It is then washed until the yellow staining disappears, which will require about twenty minutes, and then re-developed. Any non-staining developer may be used, but it should be weak, not more than half a grain of the developing substance to each ounce of water; that is, an negative developer ordinary diluted to about one-fourth of its normal strength. Even in this weak solution development is fairly rapid, and it should be stopped at an early stage if a moderate degree of reduction is required. If taken too far the plate will not be reduced at all. but intensified. Considerable practice is necessary before the exact degree of reduction can be judged correctly. The method is so valuable that it is well worth while to experiment with three or four waste negatives as a guide for future work.

NEGATIVE VARNISHES.

How to Varnish.

Using Cold Varnish.

First place negatives where they will become perfectly dry,

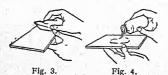


Fig. 2.

e.g., near a fire (fig. 1) or on a bath hot water tank.

Next lay out to get quite cold (fig. 2).

Dust negatives with a strip of cotton plush or camel's hair brush (fig. 3).



Poise negative on tips of fingers, steady with thumb and pour pool of cold varnish on to centre of the negative (fig. 4). Use plenty of varnish.

Let pool spread of itself (fig.5).



Fig. 5.

Fig. 6.

Now incline plate so as to cause the varnish to flow into right-hand corner (fig. 6).

Then into the left-hand far corner (fig. 7).

Then into the left-hand near corner (fig. 8).

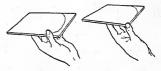


Fig. 7.

Fig. 8.

Finally raise the negative so as to let the excess of varnish flow back into the bottle (fig. 9).



Fig. 9. Fig. 10.

In tilting the negative to distribute the varnish, return the plate to the level position a little before varnish has reached the corner; the wave of varnish will carry the coating into the corner, and you will avoid getting varnish on the glass side or up your sleeve.

As last drops of varnish run into the bottle, rock negative to and fro (fig. 10), so as to avoid a streaky coating. Then stand the negative on edge on blotting paper to dry.

Cold Varnishes.

| Celluloid | | 1 oz. |
|--------------|------|--------------------------------------|
| Amyl acetate | •••• | (10 gms.) 50 ozs. (500 c.c.s.) |

To counteract the sickly odour of amyl acetate, add a small proportion of oil of lavender.

This may be flowed over or applied with a brush to the cold negative.

| Zanzibar copal | | 6 ozs. |
|----------------|---|-------------------------|
| Amber (fused) | | (30 gms.) 1 oz. |
| Ether | | (5 gms.) 60 ozs. |
| Acetone | | (300 c.c.s.) 40 ozs. |
| Chloroform | 1 | (200 c.c.s.) 4 ozs. |
| | | (20 c.c.s.) |

| 20% shellac solu- | 2 ozs. |
|-------------------|--------------|
| tion | (160 c.c.s.) |
| Ammonia | 3 drs. |
| (0.880) | (30 c.c.s.) |
| Methylated | 4 ozs. |
| spirit | (320 c.c.s.) |

A mixture of Japanese gold size (1 part) and benzole (2 parts) forms a rather slow-drying though otherwise excellent cold varnish. The surface takes the pencil well.

Water Varnish.

| Shellac | 3 ozs. |
|------------------|-----------------------|
| Sodium carbonate | (100 gms.) 24 ozs. |
| (saturated sol.) | (800 c.c.s.) |

The shellac is allowed to soak in the liquid for twenty-four hours; the liquor is then poured away and replaced by an equal quantity of water, and the mixture boiled until the shellac dissolves. After standing some time the liquid becomes perfectly clear and bright.

Hot Varnishes.

| 1, | Sandarac | 1 oz. |
|----|-----------------|----------------------------|
| | Seed lac | (55 gms.) 1½ oz. |
| | Castor oil | (83 gms.) 3 drs. |
| | Oil of lavender | (20 c.c.s.) 1½ drs. |
| | Alcohol | (10 c.c.s.) 18 ozs.(fl. |
| | This varnish is | (1,000 c.c.s.) |

This varnish is somewhat dark in colour.

| detail in colour. | |
|-------------------|--------------------------|
| 2. Best orange | 21 ozs. |
| shellac | (125 gms.) |
| Oil of lavender | |
| Methylated | (12·5 c.c.s.) 20 ozs. |
| alcohol | (1,000 c.c.s.) |
| | |

Instead of oil of lavender, oil of turpentine (pure) can be used.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; shake, set aside to clear, and then decant. This is specially recommended for gelatine negatives.

3. White hard 15 ozs. (150 c.c.s.)

Rectified spirit 20 to 30 ozs. (200 to 300 c.c.s.)

Methylated spirit should not be used. This will be found a good varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off.

| Seed lac | 2 ozs. |
|-----------------|--------------------------|
| Sandarac | (50 gms.) 2 ozs. |
| Oil of lavender | (50 gms.) |
| | (12.5 c.c.s.) |
| Castor oil | 1 oz. (25 c.c.s.) |
| Alcohol | 40 ozs. (1,000 c.c.s. |

To prepare a good surface for the retouching pencil, the negative after varnishing is dusted over with fine resin powder and rubbed up with the fingers.

5. Sandarac ... 4 ozs. (115 gms.) Alcohol... ... 28 ozs. (800 c.c.s.) Oil of lavender 3 ozs. (85 c.c.s.)

This is a good varnish for retouching upon, and a tooth is easily obtained by rubbing.

For Film Negatives.

Water Varnish.

Borax ... 300 grs. (31·2 gms.)
Glycerine ... 300 minims (30 c.c.s.)
Shellac ... 600 grs. (62·4 gms.)
Water ... 20 ozs. (1,000 c.c.s.)

Boil together for about halfan-hour, then add—

Methylated spirit 5 ozs. (250 c.c.s.)

Dammar Varnish.

Dammar ... 1 oz. (100 gms.)
Benzole, 90% ... 10 ozs. (1,000 c.c.s.)

Filter. Benzole (viz., benzene, not "benzoline") must be of the 90% strength.

Retouching Medium.

Pale gum resin 200 grs. (22.5 gms.) 90 grs. (10 gms.) Gum dammar ... 20 grs. (2.23 gms.) Oil of juniper ... 1 dram. (6 c.c.s.) Oil of turpentine 2-4 ozs. (100-200 c.c.s.)

The gums are powdered and added to the oils, and finally enough pure asphaltum is added to give the mixture a dark amber colour when viewed through the depth of an inch.

This formula is strongly recommended by Whiting in his "Retouching" as not liable to pick, rub off, or come off on after-varnishing. It takes a great deal of work.

Ground-Glass Varnish.

Sandarac ... 90 grs. (10 gms.) Mastic ... 20 grs. (2·25 gms.) Ether (0·720) ... 2 ozs. (100 c.c.s.)

Dissolve the resins in the ether and afterwards add—

Benzole ... $\frac{1}{2}$ to $1\frac{1}{2}$ ozs. (25-75 c.c.s.)

The proportion of the benzole added determines the nature of the matt obtained.

This varnish must be applied to the cold negative or the coating will not be matt.

Tinted Varnish.

Malachite green, aurantia, or asphaltum is used for tinting the above matt varnish green, yellow, or brown respectively (for handwork on the back of a glass negative).

For the occasions, however, when a tinted matt varnish is required only in small quantity, e.g., for equalising the printing density of a negative, as convenient a means as any is to add a little ordinary iodine (flakes) to the ground glass varnish made in accordance with the above formula.

Spotting Medium.

Indian ink—Water colour. Payne's grey-Water colour.

Grind together with water only on a palette to match the colour of the negative.

Another spotting medium may be very readily compounded by thinning down ordinary sepia moist water-colour with black writing ink to the consistency of cream.

Blocking-Out Mixtures.

1.—Indian red water-colour (student's quality in tubes) is a good mixture for blocking out. It should be thinned down sufficiently to work freely. It does not crack or peel off.

2.—Commercial "Brunswick black" forms an excellent blocking-out mixture for large work, and is quickly applied with a brush.

3.—When printing on development papers, yellow or orange dye (e.g., Vanguard yellow) is a convenient blocking-out medium which is easier in use owing to its transparency. First go over the film with ox-gall on wet cotton wool; the dye then diffuses slightly beyond the edge of the brush work and avoids harsh lines.

In the case of subjects containing detail such as ladies' hair, or drapery, a weak dye application over the outline will add the necessary density to the background without clogging the hair. Then proceed as usual with a stronger wash, when stray bits not wanted to print can be taken off without leaving a sharp edge.

Titles on Negatives.

The usual method is to have the words forming the title set up in type and photographed on a "process" plate. The subject negative having been made with a clear margin round it, a strip of the title negative is laid down on this margin by stripping and the clear margin then filled up with " Photopake" or other blocking out mixture except over the strip of title, which is made dense enough, in the first instance, to print white. clear portion in a landscape negative cannot be found (in cases where the title has to appear on the view), a piece must be cut out with a sharp knife.

An alternative method is to cut away part of the negative film (round the subject), lay on the title strip and then fill in with opaque except over the title strip.

A plan frequently adopted consists in drawing the lettering, reversed, in opaque water-colour on a medium or dense part of the negative. This necessitates a capacity for drawing small letters neatly and correctly and reversing them in drawing.

A very fine mapping pen is the best tool, and it must be used lightly so as not to scratch the gelatine film. A pencil line may be drawn on the film so as to keep the line of letters perfectly straight. Indian red is the best colour to use; it is very opaque and it is more easily seen in working than a black colour.

STRIPPING.

Glass Negatives.

The following process (of Middleton and Holcroft) is a very reliable one for stripping the film from a glass negative and transferring it (with or without reversal) to a second glass plate or other support.

The materials are :-

Stock solution, made mixing methylated spirit, ozs. (250 c.c.s.); water, 1 oz. (10 c.c.s.); glycerine, 1 oz. (10 c.c.s.).

Some commercial hydrofluoric acid. Must be kept in a gutta

percha bottle.

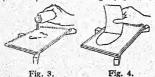
Some waxed paper, made by soaking thin note paper in hot melted paraffin wax for about half an hour.

A bow of thin cane fitted with a waxed silk thread.

Wooden window wedges, weak gum solution and a sharp penknife.



Cut through the film round the negative at a distance of about one-eighth of an inch (3 mm.) from the edge (fig. 1).



Place the negative level on three wooden wedges (fig. 2).

Pour on "stripping solution" made by adding from 6 to 30 drops of hydrofluoric acid to 1 oz. (30 c.c.s.) of the stock solution (fig. 3).

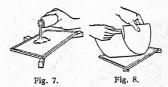
Spread the mixture with an

end of paper (fig. 4).



Fig. 5. Fig. 6.

After a minute or so try (with the finger) if the edgings of film are loose, and remove them as soon as they come away without any pull whatever (fig. 5).



Now test if the whole film is loose by passing the waxed silk thread underneath (fig. 6).



If all is free, pour on some plain stock solution (fig. 7), and apply a sheet of waxed paper (fig. 8).

Squeegee down the waxed paper lightly (fig. 9).

Then remove paper and negative film together in contact

by slipping the blade of a penknife under the film (fig. 10). Now apply the paper, with

the negative film on its under side, to a glass plate previously coated with very weak gum solution, dried and flowed over with stock solution (fig. 11).



Then squeegee down (fig. 9) and remove the waxed sheet. using the blade of the penknife to keep the corner of the film to the glass (fig. 12).

If it is desired to reverse the negative (as regards right and left), the film is transferred from the first sheet of waxed paper (fig. 10) to a second sheet of the same material. Sheet No. 1 is then pulled off and the negative film applied to a glass plate prepared with gum. etc., as already described.

FOR OLD NEGATIVES.

A less rapid solution, but one which will be safe in the case of an old or hardened negative, is :-

Methylated spirit 1 oz. (100 c.c.s.) Water 2 ozs. (200 c.c.s.) Hydrofluoric acid 60 mins.

(12.5 c.c.s.) These proportions may be slightly altered for different commercial spirits and acids.

It is better to use this formula for negatives which may have become hard or horny with age.

Dry Stripping.

A useful and speedy method of stripping the film off glass plates in a dry condition for carbon printing, etc., is the following :-The negative is thoroughly well washed after fixing.

Then immerse for five minutes in a solution of potassium carbonate (9 ozs. potass, carbonate in 8 ozs. of water). Remove from the solution and blot off surplus moisture with a soft cloth, rub dry with another cloth, and then cut through the film with a penknife at the top edge.

When thoroughly dry, i.e., in about 10 minutes, insert a needle under the film at the top corner and pull steadily, when the film will be found to leave the glass with perfect ease and certainty, This method appears to have no deleterious effect on the film at all.

Sterry Process.

The following is also for stripping films from glass negatives, especially when the negatives are to be permanently kept in the film form.

The negatives are immersed for thirty minutes in :---

Potass. carbonate2ozs. (20 c.c.s.) saturated solution

Glycerine ... I oz. (10 c.c.s.) Formaline ... 1 oz. (10 c.c.s.) Tap water ...50 ozs. (500 c.c.s.)

This mixture is cloudy soon after making, and must be either filtered or decanted from the sediment. The plates, after immersion, are stood to drain for a few moments, and the solution mopped off them with an old soft handkerchief made into a pad. They are then put aside, where they will dry slowly and uniformly, requiring, as a rule, at least six hours, and better twelve or more.

To strip them, all that is then necessary is to cut round with a sharp knife about it in from the edge of the plate, when, on lifting one corner, the film will separate easily, and lie perfectly flat. Longer immersion in the mixture or more formaline added causes the edges of the films to separate and curl up.

A greater proportion of formaline so hardens the film that it splits on drying. Artificial heat makes the stripping irregular, or the film may refuse to leave the glass. The remedy is to allow the plates to stand where they can absorb moisture before stripping.

The process is of no use for stripping negatives on celluloid film.

Film Negatives.

In the case of negatives on celluloid cut or rollfilm the following is a suitable method:—

Caustic soda ... 100 grs. (23 gms.)

Formaline ... 100 minims (21 c.c.s.)

Water ... 10 ozs. (1,000 c.c.s.)

The celluloid negative is immersed in this solution until the film shows signs of detachment, and can be rolled back with the finger. It is then placed in—

Hydrochloric acid 25 minims (5 c.c.s.)

Glycerine ... 25 minims (5 c.c.s.)

(5 c.c.s.) 1 oz. (100 c.c.)

in which it is removed from its original support to a glass or other base.

Wet-Collodion Negatives.

When the negative is thoroughly dry and cool flow over with thin solution of rubber in benzole, 2 parts pure rubber to 100 parts benzole, or ordinary cycle tyre repairing solution thinned down to about the consistency of collodion will do.

When this is dry, the negative is flowed over with "leather" collodion. This is prepared by adding a small quantity of castor oil to plain collodion. A good formula is as follows:—

 Celloidin
 ...
 ½ oz.
 (5 gms.)

 Ether
 ...
 5 ozs.
 (50 c.c.s.)
 (50 c.c.s.)

 Alcohol
 ...
 5 ozs.
 (50 c.c.s.)
 (50 c.c.s.)
 (5 c.c.s.)

 Castor oil
 ...
 ½ oz.
 (5 c.c.s.)
 (5 c.c.s.

When the collodion on the negative is dry (the drying can be hastened by heat), the negative is cut round the edges with a knife, and placed in a dish of cold water. The film should soon begin to loosen at the edges; if it does not, a little acetic acid (up to 10 per cent) may be added to the water.

The film is now transferred to a piece of paper, and thence to the new support. If the negative is to be reversed it is transferred to another piece of paper before being placed on its final support.

The following are formulæ for "salting" and sensitising papers such as Whatman's

drawing papers.

Formulæ such as these, which were largely used in the days before the industrial manufacture of printing papers, yield sensitive coatings which keep in good condition only for a few days. Moreover, they require a negative of very considerable vigour; a negative which prints well in P.O.P. is not nearly vigorous enough. In addition to this, it is necessary to over-print to an appreciable extent, since prints lose depth in the toning and fixing baths. Despite these drawbacks, the are deserving more notice than they now receive, especially for the sensitising of fabrics such as silk, satin, cotton.

First prepare the plain paper

with-

Ammonium 60 to 80 grs. (7 to 9 gms.) chloride Sodium citrate ... 200 grs. (23 gms.) Sodium chloride 40-60 grs. (5 to 7 gms.) Gelatine ... 20 grs. (2.3 gms.) Distilled water 20 ozs. (1,000 c.c.s.) Ammonium 200 grs. chloride (23 gms.) Gelatine ... 20 grs. (2.5 gms.) Water 20 ozs.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered,

and, when still warm, the paper floated upon it for three minutes and dried.

The salted paper is sensitised upon a neutral 45-grain silver

bath.

PLATINUM TONING BATH.
Potass. chloro- 9 grs.
platinite ... (1 gm.)
Water ... 20 ozs.
(1,000 c.c.s.)
Nitric acid ... 4-6 drops
(7-10 drops)

The fixing bath should be slightly alkaline in order to neutralise any trace of acid remaining in the print. A good

formula is :--

Hypo ... 3 ozs. (150 gms.)

Sodium carbonate 240 minims
10 % sol. (28 c.c.s.)

Water, to make 20 ozs. (1,000 c.c.s.)

Gold Toning.

A very satisfactory toning bath, which may be kept as a stock solution, is:—

Gold chloride ... 15 grs. (1 gm.)
Sodium acetate 450 grs. (30 gms.)
Water, to make 35 ozs.

For use, 1 part of the stock solution is diluted by adding 7 parts of water. 1 fluid ounce should be allowed for each whole plate print; 30 c.c.s. for each print 22 × 16 cms., or the equivalent in smaller sizes.

A good black tone may be obtained by toning first in gold and then in platinum. Whether gold alone, or gold and platinum are used for toning, the alkaline fixing bath given above should be used.

SELF-TONING PAPERS.

Self-toning papers are made with both collodion and gelatine emulsions. Generally speaking the gelatine papers yield a greater variety of tones according to the strength of the hypo fixing bath, and the time of immersion of the print. On the other hand the collodion papers exhibit greater certainty in the tone which they yield by simple fixation in hypo.

Printing.

The paper should be exposed under the negative until the picture is considerably darker than the finished print is required to be. With many papers the printing should be continued until the shadows of the picture show a species of metallic bronze, while at the same time the lightest parts of the subject, usually the sky, are quite perceptibly darker than the unexposed paper.

The more rapidly the paper is printed the greater the degree of over-printing which is necessary; prints which require a very long exposure, owing to the great density of the negative or the weakness of the light, need very little over-printing.

Washing.

Although some makers do not advise it, it is better to wash prints before toning, since this conduces to greater permanency of the result. Prints are washed

in running water or in four or five changes of clean water, keeping them moving.

Collodion prints are very liable to curl up in the washing water to an awkward extent. This can be avoided by placing them in the first instance in very little water—only enough to cover one or two prints. Several prints are laid face down in this water one after the other, placing each one in as soon as the preceding one has been wetted all over, and before it has had time to curl. The upper prints thus keep those below them fairly flat, and the prints show much less curl during the further washing, etc., in a greater depth of water or fixing solution.

Fixing-Toning.

The prints are fixed and at the same time toned to a rich sepia colour by immersion in a plain solution of hypo. The makers' instructions should be followed. A very usual strength is:

Hypo ... 4 ozs. (200 gms.)
Water ... 20 ozs. (1,000 c.c.s.)

With some papers it is an advantage to add a pinch or two of bicarbonate of soda to the fixing bath. This is especially so in the case of papers which it is directed should not be washed before fixing.

Purple Tones.

In place of the first washing in water, prints are soaked for about 5 minutes in:— Common salt ... 2 ozs. (100 gms.)
Water ... 20 ozs.

(1,000 c.c.s.)
They are then washed in two changes of water and then fixed as directed above.

Two-Colour Prints.

Very pleasing colour effects can be obtained by painting

parts of the dry print with the above salt solution, using a camel hair brush. On then fixing the whole print in the ordinary way, the parts which have been treated with the salt will tone to a purple, while the untreated parts will come out a warm brown. Especially with portraits, this process yields some very pleasing results.

GELATINE P.O.P.

P.O.P. prints may be toned and fixed in separate baths or toned and fixed at one operation in a combined toning and fixing bath.

For separate toning and fixing, and for some combined baths, the prints should be washed in several changes of water before toning. Then, after toning they should be washed in two or three changes of water and fixed. Finally they should be washed in running water, or in water completely changed at frequent intervals for one or two hours.

Prints may be toned with platinum instead of gold, the manipulation being the same as described for gold toning. Platinum toning is best suited to matt surface paper.

Gold Toning Bath.

The following is the best and most generally used toning bath for P.O.P., and yields fine purplish tones.

Gold chloride ... 1½ grs. (0.3 gms.)

Ammonium ... 15 grs. (3.5 gms.)

Sulphocyanide (3.5 gms.)

Water ... 10 ozs. (1.000 c.c.s.)

It is necessary for this and all sulphocyanide baths to ripen. The best method of mixing is to boil the water and to dissolve the gold in one half and the sulphocyanide in the other while the water is hot. Then pour the gold into the sulphocyanide in small doses, stirring all the time; use when cool. If cold water is used, the mixture should be allowed to stand 12 hours.

STOP FOR GOLD TONING.

A weak solution of soda sulphite (5 grs. per oz.) (11 gms. per litre) at once stops the action of a gold toning bath.

SALT BATH.

A short immersion of prints in the following bath prior to the first washing favours even toning and prevents spots and stains from rusty tap water:—

Salt 2 ozs. (100 gms.)
Sodium carbon- 1 oz. (50 gms.)
Water 20 ozs. (1,000 c.c.s.)

If prints are to be toned in the platinum bath the carbonate should be omitted.

Combined Baths.

VALENTA'S FORMULA.

| Нуро | 8 ozs. |
|----------------|----------------|
| Ammonium sul- | (400 gms.) |
| | |
| phocyanide | (50 gms.) |
| Lead nitrate | 175 grs. |
| | (20 gms.) |
| Alum | 350 grs. |
| | (40 gms.) |
| Water, to make | 20 ozs. |
| | (1,000 c.c.s.) |
| | |

Dissolve the hypo in the water, add the sulphocyanide, then add the alum dissolved in a little water, and also the lead, and add to the hypo. Heat the mixture to 120 deg. F. for ten minutes; allow to cool. For use take—

 Stock solution ... (as above)
 10 czs. (100 c.c.s.)

 Water 10 czs. (100 c.c.s.)

 Gold chloride ... 3½ grs. (from stock sol.)
 (0.08 gm.)

H. W. Bennett's Formula.

A serious objection frequently urged against combined toning

and fixing is that prints may reach the desired tone before they are completely fixed, and, in that case, deterioration is inevitable. A further objection is that, with a bath compounded for repeated use, toning may continue after the gold in the solution is exhausted, and fugitive prints will result.

These two weak points in combined toning and fixing are removed by adopting the following formula. Sufficient solution for the prints in hand is compounded from the following stock solutions, used once only and thrown away. The minimum time for combined toning and fixing in this bath is twelve minutes.

Five stock solutions are prepared, each of which will keep indefinitely. The feature of this bath is that equal quantities of each bath are taken, excepting that for each drachm of B, C, D and E, one ounce of A is taken, and the bath is ready for use within five minutes of mixing. No calculation is necessary whatever quantity of bath is required.

A. Hypo inst. 10 ozs. (400 gms.)

Water, to printe 20 ozs. face d (1,000 c.c.s.)

B. Amp after 2 ozs.
Sich one in asle (242 gms.)
Wy one has bee'e 81 ozs.
1 before it h: (1,000 c.c.s.)

C. L The upper

E se below t

the prints (1000 c.c.s.)

D. Gl during tl 15 grs. etc., in a gre (1 gm.) Wor fixing solte 2023.7 drs. (83 c.c.s.)

E. Sparser 1 oz. (100 c.c.s.)
W 5 6 - ed (1,000 c.c.s.)
W 5 6 - ed (1,000 c.c.s.)

For use 5 5z. A, 1 drm. B, 1 drm. Two working by the metric sy teng C, 60 c.c.s. A, 4 c.c.s. B, 4 drm. C, 60 c.c.s. water, 4 c.c.s. D and 4 c.c.s. E. The measure must be well rinsed after measuring C and D. The mixing appears complicated in the description; in use it is simple. For each ounce of A, 1 drachm of each of the other solutions is required, the quantity being determined by the number of prints to be toned, and the water added after the C solution being twice the quantity of A. This applies to working by English measures. When using the metric system the quantities of B, C, D and E are

1 c.c. for every 10 c.c.s. of A., and the amount of water 1½ times the quantity of A. For this reason the proportion of hypo to water in the A solution is less in the metric formula than in the English. 1 oz. of A or 40 c.c.s. will be sufficient for a print 8 × 6 ins., or 20 × 15 c.m.s., and these 'quantities should be followed according to the number of prints to be toned. No preliminary washing is necessary.

Reducer for P.O.P. Prints.

The best reducer for overprinted P.O.P. prints is made at the time of use from 10 per cent. stock solutions of (A) ammonium sulphocyanide and (B) potass, ferricyanide. The reducing solution consists of:—

A solution ... 5 ozs. (10 c.c.s.) B solution ... $\frac{1}{2}$ Oz. (1 c.c.) Water, to make... 24 ozs. (50 c.c.s.)

This is used on the prints after toning, fixing and well washing out the hypo in the usual way.

This reducer acts perfectly on P.O.P. prints, even after gold toning. If anything, it improves the tone of the print by rendering it somewhat cooler.

Platinum Toning.

PHOSPHORIC ACID.

CITRIC ACID.

Potass. chloroplatinite (0.45 gm.)

Sodium chloride (40 grs.
(salt) (4.5 gm.)

Citric acid ... 50 grs.
(5.7 gms.)

Water, to make... 20 ozs.
(1,000 c.o.s.)

HADDON'S FORMULA.

STOP FOR PLATINUM TONING.

A weak solution of sodium carbonate (10 grs. per oz.—21 gms. per litre) instantly arrests the toning action of a platinum bath.

BROMIDE, CHLORO-BROMIDE AND GASLIGHT PAPERS.

Amidol Developer.

Sodium sulphite 240 grs. (55 gms.)
Potass. bromide 6 grs.

Water, to make

6 grs. (1.4 gms.) 10 ozs. (1,000 c.c.s.) When dissolved add-

Amidol 24 grs. (5.5 gms.)

For stronger prints the water may be reduced to 8 ozs, and 800 c.c.s, respectively.

For gaslight paper the bromide should be reduced to 1.5 grs. (0.35 gm.). This smaller quantity of bromide may be used for bromide prints that are not intended for toning, as it produces a colder black. For prints intended for toning the quantity of bromide specified in the formula must be used.

This developer will not keep in good condition for more than 2 days.

Metol-Hydroquinone.

One solution.

| Metol | 5 grs. |
|-------------------------|--|
| Sodium sulphite cryst. | (1·15 gms.) 160 grs. (35·2 gms.) |
| Hydroquinone | 15 grs. (3.5 gms.) |
| Sodium carbonate cryst. | 160 grs. (35·2 gms.) |
| | 5 grs. (1.15 gms.) |
| Water, to make | 10 ozs. (1,000 c.c.s.) |
| | |

For gaslight prints the promide should be reduced to 1.5 grs. (0.35 gms.). See Note on Amidol developer.

Dissolve the chemicals in warm water and use when cold.

The instructions for dissolving metol in the developers for negatives should be carefully noted,

This developer will remain in good working condition for several weeks in well-corked bottles filled to the neck. It may be used so long as it remains clear and colourless.

Two-solution.

No. 1.

| 480 grs. (110 gms.) |
|------------------------|
| (110 gms.) |
| 80 grs. |
| (18·3 gms.) |
| 20 grs. |
| (4.6 gms.) |
| 60 grs. |
| (14 gms.) |
| 20 grs. |
| (4.6 gms.) |
| 10 ozs. |
| (1,000 c.c.s.) |
| |

No. 2.

| Sodium carbonate | 640 grs. |
|------------------|----------------|
| cryst. | (147 gms.) |
| Water, to make | 10 ozs. |
| | (1,000 c.c.s.) |

For gaslight prints that bromide should be reduced to 5 grs. $(1\cdot15 \text{ gms.})$. See note on Amidol developer.

These solutions will keep for a very long time in well-corked bottles, even if the bottles are only partially full.

For use, take No. 1, 1 part; No. 2, 1 part; water, 2 parts.

Chlorquinol.

(For Chloro-bromide Papers.)

| Sodium sulphite | $\frac{1}{2}$ oz. |
|------------------|-------------------|
| cryst. | (50 gms.) |
| Sodium carbonate | doz. |
| cryst. | (50 gms.) |
| Potass. bromide | 8 grs. |
| | (1.8 gms.) |
| Chlorquinol | 30 grs. |
| | (7 gms.) |
| Water, to make | 10 ozs. |
| | (1,000 c.c.s.) |

Time of development, 2 to 3 minutes at 65° F. For warmer tones, dilute with an equal bulk of water, increase the exposure, and add more bromide.

If this developer is prepared in two solutions it has much better keeping qualities.

A. Sodium sulphite, 1 oz.
cryst. (100 gms.)
Chlorquinol ... 60 grs.)
Potassium 15 grs.
bromide (3.5 gms.)
Water, to make 10 ozs.
(1,000 c.c.s.)

B. Sodium carbonate, cryst. 1 oz. (100 gms.) Water, to make 10 ozs. (1,000 c.c.s.)

For brown-black tones mix equal parts of A and B. For warmer tones, increase the exposure, take 1 part A, 1 part B, 2 to 6 parts of water, according to the tone desired, and add more bromide.

Stress Marks on Bromides.

If stress marks occur, they can usually be removed by gently rubbing each print with a soft rag as soon as it has had a minute or so in the wash-water.

An alternative method is to rub the surface of the print with a piece of soft rag moistened with methylated spirit when dry.

Sulphide Toning.

Of the many methods of producing warm brown tones on bromide prints the following is the best and most reliable. The prints are bleached in a bath of ferricyanide and bromide, briefly washed, and darkened or toned in a solution of sodium sulphide. Prints require to be well washed from hypo before being put into the bleacher. In summer, or in places where the water supply has a softening action on prints, it is well to fix them in a fixing hardening bath. (See "Fixing.")

STOCK BLEACHING SOLUTION.

365

 $\begin{array}{cccc} Potassium & bro-\\ mide & & (50~gms.) \\ Potassium & ferri-\\ cyanide & (100~gms.) \\ Water, to make... & 10~ozs.\\ (1,000~c.c.s.) \\ \end{array}$

This solution will keep indefinitely if protected from strong light. To prepare the working solution take 1 part stock and 9 parts water.

SULPHIDE BATH.

It is best to keep the sulphide in strong 20 per cent. solution; a weak solution does not keep well. Use the pure white sodium sulphide, dissolving 4 ozs. in water and making up to 20 ozs. with water (200 grms. per litre).

To make the working sulphide bath, mix:—

Stock 20% ... 3 parts sulphide soln.
Water, to make... 20 parts

The prints are treated for two or three minutes in the bleacher—that is, until the picture becomes faint brown in colour. If any black is left at the end of two minutes it is a sign that the bleacher (which may be used repeatedly) is becoming exhausted.

Rinse in clean water for halfa-minute to one minute. Longer washing at this stage does no good and may impair the tone.

Transfer to sulphide bath, where prints should darken to the full brown or sepia in 30 to 60 seconds.

Throw away the sulphide bath after the day's use. Stale spoilt sulphide solution is the most frequent cause of bad tones or of refusal of prints to darken in the sulphide bath.

Finally wash for half-an-hour in running water.

The results by the sulphide process are quite permanent.

Blue stains, in spots and patches, on sulphide-toned prints are due to iron, either as rust in the tap-water or as impurity in alum. Fit a flannel filter to the tap and use pure alum.

Dilute hydrochloric acid applied to the blue spots, after the print is thoroughly dry, will remove the spots without injury to the print. Washing is then necessary to remove the acid.

Sulphide-toned prints of bad colour or insufficient depth can be retreated, e.g., by bleaching in:—copper bromide, 260 grs. (27 gms.); sodium bromide, 5 ozs. (222 gms.); water, 20 ozs. (1,000 c.c.s.). This is used in the dark room, the bleached print taken into daylight and redeveloped with amidol or other clean developer, after which it may be re-toned. Over-dark sulphide-toned prints of light subjects, e.g., sketch portraits or enlargements which are afterwards to be worked up, may be reduced by putting back into the ferricyanide-bromide bleach after washing out the sulphide darkening bath.

Silver-Mercury Sulphide.

(H. W. Bennett's process.)

By this process any colour from warm brown to brown black can be produced with certainty, provided that the development of the print has been full.

The bleaching bath is compounded from two stock solutions, according to the colour desired. A. Potass. ferricyanide 2 ozs. (100 gms.) Potass. bromide 1 oz.

Water, to make (50 gms.) 20 ozs. (1,000 c.c.s.)

B. Mercuric chloride ½ oz. (25 gms.)

Water, to make 20 ozs. (1,000 c.c.s.)

To prepare the bleaching bath, take the various quantities of A and B specified for each ounce of working solution, according to the colour desired.

A. 60 parts ... Rich warm brown

A. 60 parts ... } Cool brown

A. 40 parts ... Very deep

B. 40 parts ... brown block

B. 80 parts ... Brown-black

Different proportions may be used for obtaining intermediate tones.

Whenever solution B is used in compounding the bleaching bath, an acid bath must be used between bleaching and sulphiding.

Hydrochloric 100 minims acid (pure) (10 c.c.s.)
Water, to make 20 ozs. (1,000 c.c.s.)

After five minutes' washing from the bleaching solution, two or three changes of this acid bath must be given, and then a few minutes' washing before placing the prints in the sulphide solution. (This is the ordinary sulphide bath described in the preceding formula.)

When the bleaching bath contains a proportion of solution B the print is intensified as well as toned, the degree of strengthening depending on the proportion of B used. Allowance must be

made for this in printing by decreasing the exposure, not by shortening the development. When the full quantity of the mercuric solution B is used, three-fourths of the normal exposure will be correct in making the print, which should be developed normally.

Hypo-Alum Toning.

The following is the method (much used on the commercial scale) for toning bromide and gaslight prints to a warm purplish sepia. Prints must be fixed in a hardening-fixing bath. They are then toned in a hot mixture of hypo, alum, etc., made as follows:—

Hypo ... 1 lb. (400 gms.)

Hot water ... 80 ozs. (2,000 c.c.s.)

Dissolve, and then add—
Alum ... 3½ ozs. (87 gms.)

Stir well, boil for 2 or 3 minutes, cool to about 150 F. (65 C.) and then add the Silver Ripener, made as below:—

Stir well again and add:

Potass. iodide ... 40 grs. (2.3 gms.)
The whole mixture is thoroughly

well stirred.

Silver Ripener.

Silver nitrate ... 20 grs. (1.3 gm.)
Water ... 1 oz. (30 c.c.s.)

To this add drop by drop, strong (·880) ammonia, until the precipitate first formed is just re-dissolved. Stir vigorously while adding the ammonia.

The toning bath can be used repeatedly, keeping up the bulk by occasional addition of fresh solution. The best results are obtained by keeping the bath hot, or as warm as the emulsion

will stand, say 100° to 120° F. (38° to 50° C.). At this temperature prints will tone in from 20 to 30 minutes. The bath can be used cold, in which case toning takes about 24 hours, the prints requiring to be turned over every little while.

After using the hot bath, it is well, after toning, to pass the prints through a solution of:

Alum ... 250 grs. (26 gms.)
Water ... 20 ozs. (1,000 c.c.s.)

Prints are finally washed thoroughly in water.

Liver of Sulphur Toning.

Liver of sulphur (1.7 gms.) Water ... 20 ozs. (1,000 c.c.s.)

This bath is used at about 80 deg. F., and tones in about 30 minutes, yielding results very similar to those with hypo-alum. Commercial papers are not, however, all equally suitable for "liver" toning.

Nitro-Sulphide Toning.

(W. B. Shaw's Process.)

This process is based on the fact that sulphide solutions of a suitable oxidising agent tone directly, thus obviating the necessity for an intermediate bleaching bath.

The nitro-sulphide process will yield more pleasing results on "gaslight" papers than the bleach and sulphide method, the colours resembling those obtained by hypo-alum toning.

Stock solutions:

Solution A.

A saturated solution of barium sulphide. To prepare this, \(\frac{1}{2}\) oz. (12.5 gms.) of barium sulphide is

shaken up with 20 ozs. (1 litre) of warm water and the undissolved portion allowed to settle. The clear liquid is poured off for use. The bottle must be kept tightly closed.

Solution B.

A 10 per cent. solution of sodium meta-nitro-benzene sulphonate.

For use take: A. 4 ozs (100 c.c.s.) and B. 2 drams (6.25 c.c.s.).

The best results are obtained by giving prints a generous exposure and developing with M.Q. The final tones vary considerably with different brands of paper, ranging from purple to warm brown. As the progress of toning is under direct observation, intermediate colours can be secured with ease.

With slow bromide and chlorobromide papers toning may be too rapid for convenient control. In such cases, the solution should be largely diluted with water.

If toning is carried to completion, fast contrasty papers usually give cold tones and slow normal papers warm ones.

The temperature of the toning bath should not be below 60° F. (16° C.).

Prints for this process need not be completely washed after fixing, but it is just as well to wash for a few minutes before toning.

Copper Toning.

| A. Copper | 60 grs. |
|-----------------|----------------------|
| sulphate | (6.25 gms.) |
| Potass. citrate | 240 grs. |
| Water | (25 gms.) 20 ozs. |
| | (1,000 c.c.s.) |

B. Potass. 50 grs. (5·2 gms.)
Potass. 240 grs. (25 gms.)
Water ... 20 ozs.

(1,000 c.c.s.)
The citrate in this formula is the neutral salt.

Use equal parts of each. If prints are pinkish in the highlights use more citrate in the A or B solution.

The copper toning process gives a range of tones from warm brown to bright red, according to the time of action of the solution. Toned prints last fairly well but are inferior in permanence to those made by the sulphide-toning method. The toning has scarcely any perceptible effect on the depth of prints.

In this mixture which must be used soon after making, prints gradually tone and pass through the stages of purplish black and brown to a decided red. Prints should be well washed from hypo before toning.

Uranium Toning.

This old method yields brown to reddish tones. It intensifies the prints, but the results often prove impermanent.

| JIOYC IIIIDCI III aliciic. | |
|----------------------------|------------------------|
| A. Uranium | 90 grs. (9.36 gms.) |
| nitrate | (9·36 gms.) |
| Water | 20 ozs. |
| | (1,000 c.c.s.) |
| B. Potass, ferri- | 90 grs. (9·36 gms.) |
| cyanide | (9.36 gms.) |
| Water | 20 ozs. |
| | (1 000 ccs) |

Use equal parts of A and B and add 20 minims of glacial acetic acid to each ounce of mixture (40 c.c.s. per litre). The prints must be free from hypo. After toning wash in several changes of *still* water till the high-lights are clear. Washing

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in running water will remove the toning in patches. Citric acid (10 grs. per oz.—22 gms. per litre) or oxalic acid (5 grs. per oz.—11 gms. per litre) instead of acetic is an aid to pure whites.

As a means of rendering uranium-toned prints permanent it is recommended to fix the toned prints for five minutes in hypo, ½ oz. (25.0 gms.); potass. metabisulphite, 70 grs. (8.0 gms.); water, 20 ozs. (1,000 c.c.s.)

Blue Tones

| Α. | Potass. ferri- cyanide | 15 grs. (1.56 gms.) |
|----|---------------------------|--|
| | Sulphuric acid, | 30 minims (3 c.c.s.) |
| | conc. Water | 20 ozs. |
| В. | Ferric ammonia | (1,000 c.c.s.) 15 grs. (1.56 gms.) |
| | Sulphuric acid, | 30 minims |
| | Water | 20 ozs. (1,000 c.c.s.) |

Mix equal parts of A and B at time of use. Prints should be light, as the toning also intensifies. When toned, wash to remove all yellow colour.

Gold Toning.

For improving the colour of greenish or rusty black prints, and for bluish tones.

Ammonium 150 grs. (15 gms.)
Chloride of gold 10 grs. (1 gm.)
Boiling water ... 20 ozs. (1,000 c.c.s.)

Use as soon as cool. Place the wet print face upwards on a sheet of glass, squeegee into contact, blot off superfluous moisture, and paint the above bath on with a broad flat brush; when the desired tone is reached wash well and dry.

Glazing Prints.

GLAZING SOLUTION.

(For Gelatine Prints only.)

In glazing prints by stripping from glass plates or ferrotype sheets, the best means for avoidance of sticking of prints is the use of a so-called "glazing" or "stripping" solution. In the use of rotary drying - glazing machines, a glazing solution may be of advantage in dealing with prints on a paper which does not strip easily. The glazing solution may be bought ready made or prepared from:—

Ox-gall, 1 oz. prepared (12 c.c.s.) Water ... S0-160 ozs.

(1,000 to 2,000 c.c.s.)
The prints are soaked in this solution for a minute or two and laid on the glasses without intermediate washing.

Those who do not object to the mess (and smell), may prepare ox-gall by buying gallbladders from a butcher or slaughter-house, and mixing the fluid from a bladder with formaline in the proportion of about 2 ozs. formaline per gallon or gall. (12.5 c.c.s. per litre). mixture is filtered through several thicknesses of butter muslin, after which it is bottled and will keep for a long time.

A polishing medium to be applied to glass or ferrotype before squeegeeing the print is—

Beeswax ... 20 grs. (45 gms.)
Turpentine ... 1 oz. (1,000 c.c.s.)
Spermaceti wax 20 grs. (45 gms.)
Benzole 1 oz. (1,000 c.c.s.)

a few drops of which are rubbed on with a piece of flannel, and the glass afterwards polished with silk rag or chamois leather.

ENAMEL COLLODION.

(For Glazing both Gelatine and Collodion Prints.)

| Soluble gun | | 125 grs. |
|----------------|---|---|
| cotton | | (13 gms.) |
| Alcohol | | 10 ozs. |
| Sulphuric ethe | r | (500 c.c.s.) 10 ozs. (500 c.c.s.) |

Glass plates cleaned with French chalk are coated with the above, and, as soon as coating has set, slipped under prints which are waiting face down in water. Prints are withdrawn and squeegeed. When they are half dry, a stout backing paper is pasted on with good thick photo-mountant, the prints then allowed to dry. The object of the backing paper is to prevent penetration of moisture when the prints are mounted. They are finally stripped off.

Drawings from Ink or Prints.

The following process can be used with prints on bromide, gaslight or P.O.P. paper.

After outlining the subject in waterproof Indian ink, bleach out the image in—

| Thiocarbamide | 240 grs. |
|---------------|---------------------------|
| Nitric acid | (25 gms.) 4 drs. (fl.) |
| Water | (25 c.c.s.) 20 ozs. |
| | (1,000 c.c.s.) |

Or the following bleaching solution may be used:—

| Iodine solution | 30 minin |
|-----------------|------------|
| 73.1 | (6 c.c.s.) |
| Potass. cyanide | 5 minims |
| solution | (1 c.c.) |
| Water | 1 oz. |

The iodine and cyanide solutions are each of 10 per cent. strength. The iodine is dissolved with aid of potass. iodide; the cyanide in plain water.

THE CARBON PROCESS.

Procedure.—Tissue, i.e., paper coated with a mixture of gelatine and pigment colour, is made sensitive by immersion in bichromate solution, dried, and printed under the negative by daylight. As the colour of the tissue hides the effect of light, the printing is done by aid of an actinometer.

The effect of the light is to render the gelatine insoluble—the greater the action, the deeper down into the tissue. "Development" consists in dissolving out in warm water the tissue which remains soluble.

As a skin of insoluble tissue is formed over the whole top

surface of the print, the coating is first transferred, face down, on to a fresh support.

To do this, the exposed tissue is soaked in cold water along with a sheet of gelatine-coated transfer paper, the two squeeged together, put under pressure for about 20 minutes, and then placed in hot water.

The original support of the sensitive surface is stripped off, leaving the tissue with its face (the insoluble side) on the transfer paper. The soluble gelatine can be then dissolved away, carrying the pigment with it, and the prints are finally passed through an alum

bath, washed and dried.

As this transference of the print to a new support causes the picture to appear reversed as regards right and left, it is necessary (where this is an objection) to transfer first on to "temporary support" for development, and from this again on to the "final support."

Sensitising Solutions.

| Potass. | bich | ro | m | do oz. |
|---------|------|-----|------|-----------------|
| ate | | | | (50 gms.) |
| Water | | | | 10-20 ozs. |
| | | | | to 2000 c.c.s.) |
| Liquor | amn | 101 | nia, | 30 minims |
| 0.88 | Э. | | | (7 c.c.s.) |

If the tissue be squeegeed on to a ferrotype plate, and allowed to dry upon it, the drying may be done in the light of an ordinary room. The face of the tissue is then protected from light, dust, and injurious vapours.

FIXING OR HARDENING BATH.

| Alum | | ½ oz. |
|-------|-----|----------------|
| | | (50 gms.) |
| Water | ••• | 10 ozs. |
| | | (1,000 c.c.s.) |

H. W. Bennett's formula:-

| 7.1 | | 100 |
|---------------|---------|---------------|
| Potass. bichr | omate | |
| | | (28 gms.) |
| Citric acid | | 30 grs. |
| | 1 1 1 1 | (7 gms.) |
| Water | | 10 ozs. |
| | | (1.000 c.c.s. |

To this, add liquor ammonia sufficient to change the orangered colour to lemon yellow.

This bath is suitable for negatives which will yield good prints in contact bromide printing. Tissue sensitised in it will keep longer than that sensitised in the former solution, but it is much less sensitive. It is not suited for the very strong negatives usual in carbon printing.

Bichromate Stains, Etc.

To remove bichromate stains from fingers, nails, etc., apply dilute ammonia to the parts until the stains disappear, then well wash the hands with warm water and soap.

Waxing Solutions.

No. 1 formula is for carbon prints or for removing collodion

| 1. Beeswax | 50 grs. |
|-------------|----------------|
| | (11.5 gms. |
| Benzole rec | t. 10 ozs. |
| No. 1 | (1,000 c.c.s.) |

No. 2 formula is for flexible supports.

| 2. Yellow resin | 180 grs. |
|-----------------|---------------|
| | (41 gms.) |
| Yellow bees- | 60 grs. |
| wax | (13.7 gms.) |
| Rect. spirit | 10 ozs. |
| of turpentine | (1,000 c.c.s. |

Carbon Transparencies.

The following is a substratum for use in making carbon transparencies.

| Nelson's No. 1 | ³ / ₄ oz. (37⋅5 gms.) |
|-------------------------|--|
| gelatine Water | 20 ozs. |
| Potass. bichrom- ate | (1,000 c.c.s.) 12 grs. (1.37 gms.) |

Well cleaned plates are coated with this and dried, when they are fully exposed to light, which will render the coating insoluble

Gelatine Solutions.

For transferring carbon pictures from flexible support to ivory opal, glass, &c.

The chrome alum is previously dissolved in 2 ozs. (100 c.c.s.) of water and the solution added to that of the gelatine.

For coating, drawing-papers

for the single transfer process

Apply with a brush.

The chrome alum is previously dissolved in 2 ozs (100 c.c.s.) of water and the solution added to that of the gelatine.

In adding a solution of chrome alum to one of gelatine, both solutions should be at a fairly high temperature, 130° to 160°F.

THE CARBRO PROCESS.

In this process a carbon print is made from a bromide print or enlargement without the aid of daylight.

A good bromide print must first be prepared, care being necessary to ensure correct exposure and full development. Weak, flat bromides give unsatisfactory results.

The print, which has been thoroughly washed and dried, is placed in a dish of clean water, and should remain in this until quite limp or until required.

A piece of carbon tissue of the required size, which must be about ½ in. larger each way than the bromide print, is "sensitised" by immersion for three minutes in the "sensitising bath" given below containing potassium bichromate, fericyanide and bromide.

During this time the bromide print should be removed from the water and laid face upwards on a sheet of stout glass. When the tissue has been in the "sensitising" bath for the requisite time it is removed, and allowed to drain for 15 seconds. It is then placed in the acid-formaline bath. The time of immersion in this solution varies according to the brilliancy desired in the resulting print, and may be from 15 to 25 seconds, the longer immersion giving greater softness.

STOCK SOLUTION No. 1. (For making Sensitising Bath.)

Sensitising Bath for Use. Stock solution No. 1 6 ozs. (100 c.c.s.)

(1,000 c.c.s.)

Water ... 18 ozs. (300 c.c.s.)*

This bath may be used repeatedly, but should be strained through fine muslin or cotton wool after use.

STOCK SOLUTION No. 2. (For Acid-Formaline Bath.)
Acetic acid, glacial 1 oz.

Acetic acid, glacial 1 02. (10 c.c.s.)

Hydrochloric acid, pure (10 c.c.s.)

Formaline ... 22 ozs. (220 c.c.s.)

Water ... 1½ ozs. (15 c.c.s.)

The formaline is the commercial 40 per cent. solution of formaldehyde.

Acid-Formaline Bath for Use. Stock solution No. 2 1 oz.

Water ... (10 c.c.s.) 32 ozs. (320 c.c.s.)

Renew this bath frequently as contamination with "sensitiser" lessens its activity.

The tissue is now laid face downwards upon the bromide print, and the two squeegeed into contact. A flat squeegee is used, and particular care taken that the tissue does not move on the surface of the bromide during the early stages of squeegeeing.

Both print and tissue are now lifted from the glass, and placed between greaseproof paper, where they are allowed to remain for 15 minutes. During this time a piece of transfer paper, similar to that used in carbon printing and larger in size than the tissue in use, is selected and placed in a dish of water.

If a thin transfer paper is used, allow it to soak for 5 minutes, while, if thick, 10 minutes will be necessary.

The transfer paper is then laid face upwards upon a sheet of glass, and is ready to receive the carbon tissue.

The bromide print and its adhering tissue should now be taken from between the grease-proof paper, and the two carefully separated by lifting one corner of the print and gently but decisively pulling the two surfaces apart. The bromide print should be dropped into a dish of water, and the tissue placed film down upon the transfer paper.

The tissue is then squeegeed to the support transfer paper, and the two placed between blotting paper for from 20 to 40 minutes. The bromide print, after well washing, may be re-developed for future use.

When the tissue and final support have been in contact for the required time they are placed in a deep dish of water at a temperature of 95° to 100° F. In a few minutes the pigmented gelatine begins to dissolve: colour oozes out at the edges of the tissue.

The two papers are now separated by taking a corner of the tissue and gently pulling the two apart under the water. The majority of the pigmented gelatine will now be found upon the transfer paper, and development of the image is proceeded with by pouring warm water over the surface of the print. The image is very tender at this stage, and care should be taken that nothing touches its surface. When development is complete the print is transferred to a 3 per cent. solution of alum, and when all signs of vellowness in the high-lights have disappeared, is washed for a few minutes in water, and then hung up to dry.

GUM-BICHROMATE.

The following (greatly abridged) are working instructions in this now little-used process according to perhaps the most accomplished exponent of it, M. Robert Demachy.

The gum solution is one of ordinary gum arabic of 50 per cent. strength in cold water.

The sensitiser is a saturated solution of potass. bichromate.

To make the sensitive solution 1 part of bichromate solution and 2 parts of gum solution are mixed, and then moist water-colour tube pigment added in sufficient quantity, as ascertained by trial.

The paper is coated by applying the mixture with a flat hog's hair brush, afterwards smoothing the coating with two wide, flat hog's hair brushes.

Exposure under a quickprinting negative ranges from 10 minutes (in the shade on a bright summer day) to much longer.

Prints are developed either by simple soaking in cold or tepid water, by pouring water over the print supported on a glass plate, or by delicate friction with a wet brush or sponge.

THE BROMOIL PROCESS.

In this form of the oil process a bromide print or enlargement is treated so as to bleach the image and at the same time bring the print into a condition similar to that produced by exposure of sensitised paper in the oil process.

The bleach is made from the two following stock solutions:—
A. Copper chloride 160 grs.

Sodium chloride 202. 290 grs. (common salt) (266 gms.)

Hydrochloric 3 minims acid (0.6 c.c.)

Water ... 10 ozs.

B. Potass. bichromate 55 grs. (12.5 gms.)
Water ... 10 ozs.

The bleach is made up by mixing 1 part of A, 1 part of B, and 2 parts of water.

(1,000 c.c.s.)

The bromide print is soaked in water for about 5 minutes until limp, drained from surface moisture and placed in the bleacher. Within from 3½ to 4½ minutes the picture is converted into a faint brownish image. When thus fully bleached the print is washed in running water for about 15 minutes to free it from yellow stain and is then fixed in a hypo bath containing 1 oz. of hypo in 20 ozs. of water (50 gms. per litre). It is then again washed for about half an hour.

Before pigmenting the print is soaked in warm water, the temperature of this water requiring to be adjusted to the quality of the bromide paper. Average temperatures are those from 70 to 80° F. (21-27° C.). The print is soaked for a time

which may range from 15 to 45 minutes and is then ready for pigmenting.

Separate Bleaching.

Venn Method.

Bromide prints, developed to a Watkins factor of 8 in the maker's amidol developer, used at half strength, are transferred directly after draining to a 10 per cent. hypo solution for 5 minutes. They are then thoroughly washed and dried.

After soaking for 5 minutes, the print is bleached in:—
Copper sulphate 95 parts

(10% soln.)
Potass. bromide 5 parts
(10% soln.)

After remaining here half a minute after the bleaching appears complete, the print is

drained and put directly in :-

Potass. bromide 4 ozs. (200 c.c.s.)
Potass. bichromate (1% soln.) (100 c.c.s.)
Water, to make 20 ozs.

(1,000 c.c.s.)

for four minutes.

After washing for five minutes in several changes of water, it is fixed for two minutes in 10 per cent. hypo, washed for fifteen minutes in one or two changes of water and dried. A temperature of 60-65° F. (15-5-19° C.) should be maintained through these operations.

Before inking up, the dried prints are soaked for times ranging from 30 to 45 minutes.

To dry a Bromoil quickly, soak in methylated spirit and hang up.

THE OIL PROCESS.

Gelatine-coated paper is sensitised with bichromate, printed under the negative, and treated in cold water. The faint image has the power of fixing greasy ink.

SPIRIT SENSITISER (Demachy).

Prepare 6 per cent, ammonium bichromate stock solution by dissolving 1½ ozs, of this salt in 25 ozs, of water.

To make the sensitiser mix at time of use :—

Stock bichromate 1 part.

Alcohol, pure 90° 2 parts.

The sensitiser is applied with a flat hog-hair brush, about 3 oz. (25 c.c.s.) serving for six 10×8 sheets of transfer paper.

The paper dries in about 18 minutes, and is printed under

the negative until it shows a brown image as in the platinum printing process. The detail should show in the high-lights.

It is then soaked in several changes of water to remove the yellow bichromate (about 20 minutes), and then soaked for a further time (in a dish of water), depending on the thickness of the gelatine coating. An average time is 30 minutes; 2 to 3 hours, for more heavily coated papers. The temperature of the water should be between 65° and 70° F.

The print can be pigmented forthwith, or dried for pigmenting later on. If it is dried it requires about an hour's soaking in water at 65° to 70° F. to bring it into the best condition

for pigmenting.

PALLADIOTYPE.

In the Palladiotype process, which was introduced some years ago by the Platinotype Company, the stable metal palladium replaces platinum. With the exception that the solutions employed are different from those used for Platinotype the procedure is exactly the same. Palladiotypes afford by cold development rich warmblack prints, free from double tones, or inclination to greenish hue, and closely resemble Platinotype prints.

DEVELOPER.

| Sodium citra | | 3 ozs. |
|--------------|---------|---------------------|
| Citric acid | | 175 gms.) 8 grs. |
| Water | (| 11 gms.) 0 ozs. |
| To be used | without | 1,000 c.c.s.) |

at 65° to 70° F. (18° to 21° C).

The prints should be developed as soon after printing as feasible and, at least, one minute allowed for full development. They are then transferred direct to the first clearing bath.

The addition of small quantities of potass. bichromate to the developer gives added contrast without loss of quality. From one grain to 4 grains to 20 ozs. $(0\cdot1-0\cdot2 \text{ gms. per litre})$ may be used according to the effect desired. Printing should be slightly longer than the normal.

CLEARING BATH.

Stock Solution.

| Sodium citra | ate | 960 grs. |
|--------------|-----|------------------------|
| Citric acid | | (220 gms.) 422 grs. |
| Water | ••• | (97 gms.) 10 ozs. |

For use mix one part of stock solution with 7 parts of water.

Three baths are required, the times of immersion being not less than 5, 10 and 20 minutes respectively. These periods may be prolonged, within reason, without detriment. The prints are then washed for not less than 20 minutes in several changes of water and suspended to dry.

PLATINUM PRINTING.

In the platinum process the paper is coated with a sensitive iron (ferric) salt, and a salt of platinum. On exposure to daylight, or equivalent, the iron salt is reduced to the ferrous state, the change being accompanied by a darkening which enables the depth of printing

to be judged. Printing should be continued until all details except in the highest lights, are visible in the preliminary image.

Development is done by either floating on, or immersing in, a solution the principal ingredient of which is potassium

The ferrous salt is oxalate. soluble in this solution, and in the act of dissolving reduces the platinum salt in situ in extent corresponding with the reduction of the ferric salt by light, the permanent picture in finely divided platinum appearing simultaneously. To secure the full beauty of the process, correct exposure and full development are essential. Correctly exposed prints cannot be overdeveloped; the action automatically ceases when all the ferrous salt has been dissolved. Not less than one minute should be allowed for cold development; with hot solutions a few seconds suffice.

No fixing is required, but to eliminate iron and other salts remaining after development, the prints must first be washed in dilute hydrochloric acid solu-This is the operation known as "clearing." The acid is essential, for if omitted basic compounds will form and the paper will discolour with Accordingly, the prints are transferred direct from the developer to the first clearing bath, in which they should remain for about 5 minutes. They are then removed to a second bath for 10 minutes and again to a third bath for about 15 minutes.

The clearing solution for " black " prints should contain 1 oz. of pure hydrochloric acid to 60 ozs. of water (16.5 c.c.s. per litre) for "sepia" papers the quantity of water may be increased to 80 ozs. (1,350 c.c.s.) with advantage.

After clearing, the prints are washed for about 15 minutes (four or five changes of water are sufficient) and suspended to dry. Drying between blotters is a frequent cause of stains.

The following are the developers recommended by the Platinotype Company, the original patentees and manufacturers of the papers. Purity of the chemicals is of the utmost im-Those supplied by portance. the Company are tested, and can be relied upon.

Cold-Bath Developer.

To be used for all grades of "Black" Platinotype paper at a temperature of 65° to 70° F. (18° to 31° C.).

Stock Solution.

Potass, oxalate... 640 grs. (146 gms.) Potass, biphos-91 grs. (21 gms.) phate Oxalic acid 22 grs. (5 gms.) Water ... 10 ozs. (1,000 c.c.s.) For use dilute with equal bulk of water.

Hot-Bath Developer.

To be used for Sepia Japine Papers only, at temperature 160° to 170° F. (71° to 77° C.).

Formula for Stock Solution as the foregoing, but with water reduced to 80 ozs.

For use dilute with equal bulk

of water.

To be used for matt-surface Sepia papers at temperature 160° to 170° F. (71° to 77° C.).

24 ozs. Potass. oxalate... (250 gms.) 31 grs. Oxalic acid (7 gms.) 10 ozs. Water (1,000 c.c.s.)

To be used without dilution. During heating and when not in use the hot-bath developers should be kept covered with a sheet of glass, cut only a shade larger than the top of the dish.

IRON PRINTING PROCESSES.

Ferro-Prussiate Sensitiser.

The following is a sensitising solution for paper to be used for printing by daylight and to be kept in good condition for a considerable time (months):—

A. Ferric ammonia citrate (green) (250 gms.)

Water to make 10 ozs (1,000 c.c.s.)

B. Potass. ferricyanide (92 gms.)
Water, to make 10 ozs.
(1,000 c.c.s.)

Mix in equal parts, keep in the dark, and filter just before use.

If the ordinary brown citrate be used, the formula should contain 820 grs. (183 gms.), and the ferricyanide should be increased to 600 grs. (137 gms.).

The sensitiser is applied with a brush or sponge. The paper is printed until the shadows bronze, and is "developed" simply by soaking in one or two changes of plain water.

The following is a sensitising solution yielding a very much more rapid paper but of inferior keeping qualities, i.e. keeping in condition for about 60 days:

Ferric ammonium cit-

rate, 26% solution ... 6 parts.

Ferric ammonium oxalate 10% solution ... 2 ,, Ferric sodium oxalate, 10% solution ... 2 ,, Ferric chloride, 7%

solution ... 2 Oxalic acid, 10% solu-

tion ... 2
Potass, ferricyanide,

10% solution ... 1 part.

Solution for Writing Titles on, removing blue lines from blue prints, etc.—Potass. oxalate, 75 grs. per oz.; 165 gms. per 1,000 c.c.s.

Brightening the Colour.—Blue prints are improved in colour by a final bath of $2\frac{1}{2}$ per cent. alum solution, 3 per cent. oxalic acid or 1 per cent. hydrochloric acid

Pellet Process.

The Pellet process is for copies of line drawings only. From an ordinary tracing it gives a copy in blue lines on a white ground.

A. Pure gum arabic 2 ozs. (200 gms.)

Water ... 10 oos.

B. Ferric ammonia citrate (1,000 c.c.s. 5 ozs. (500 gms.)

Water ... 10 ozs.

Water ... 10 ozs. (1,000 c.c.s.)

C. Ferric chloride 5 ozs. (500 gms.)

Water ... 10 ozs. (1,000 c.c.s.)

Add 8 vols. of B, then 5 vols. of C to 20 vols. of A, in small doses with constant stirring.

The prints are developed on 10 per cent. solution of potass. ferrocyanide and "fixed" in 1: 25 sulphuric acid (specific gravity 1.84).

Ferro-Gallic Process.

This process is for line drawings only. It gives a copy in bluish-black lines on a white ground from an ordinary tracing.

Gum arabic ... 600 grs, (137 gms.)
Warm water ... 10 ozs. (1,000 c.c.s.)

When dissolved add the following in the order given:—

Tartaric acid ... 80 grs. (18·2 gms.)

Salt ... 360 grs. 82 gms.)

Ferric sulphate 400 grs. (91 gms.)
Ferric chloride ... 600 grs. (137 gms.)

The developer for the prints is:—Alum and gallic acid, 1 part of each; water 80 parts.

MOUNTANTS.

Starch Paste.

Mix pure starch powder with a very small proportion of cold water to form a very stiff mass. It should be so stiff that it is stirred with difficulty.

Perfectly boiling water is then poured in, about 12 ozs. for every ounce (12 c.c.s. per gram) of starch.

On stirring, the mixture will jellify without being boiled; but if it does not it is brought to the boil, cooled, the skin taken off, and the paste used on day of making.

Dextrine Paste.

Dextrine, best ... 13\(\frac{3}{4}\) ozs.
(687 gms.)

Water at 160° F. 20 ozs.
(1,000 c.c.s.)

Oil of wintergreen 5 minims
(0.5 c.c.)

Oil of cloves ... 5 minims
(0.5 c.c.)

Place the water in a vessel standing in a larger vessel of water kept to within 1° of 160° F. Stir in the dextrine slowly, and when it has all dissolved add the two preservative oils, stirring all the time

Then allow to cool, pour into bottles, and cork. Put aside in a cool place for a week or two for the mixture to congeal to a firm white smooth paste.

Liquid Gelatine.

Gelatine 1 oz. (100 gms.)

Water 6 ozs. (600 c.c.s.)

Chloral hydrate ... 1 oz. (100 gms.)

The gelatine is dissolved in the water by aid of heat, and the chloral hydrate added. After digesting for a short time the adhesive liquid is neutralised with a little sodium carbonate solution.

Gelatine.

 Nelson's No. 1
 4 ozs. (50 gms.)

 gelatine
 16 ozs. (200 c.cs.)

Soften the gelatine in the water, liquefy on a water bath, and add (a little at a time and stirring rapidly):—

Methylated spirit 5 ozs. (60 c.c.s.)

Glycerine... ... 1 oz. (12 c.c.s.)

The mountant is used hot. A piece of ground glass is dipped in hot water, drained, and the mountant brushed over it. The print is then laid face up on the roasted surface and rubbed gently in contact with a piece of paper, being then removed and pressed down on its mount.

Starch-Gelatine.

| A. | Bermuda arrow- | 8 ozs. |
|----|----------------|--------------|
| | root | (200 gms.) |
| | Water | . 4 ozs. |
| | | (100 c.c.s.) |
| В | Nelson's No. 1 | 360 grs |

B. Nelson's No. 1 360 grs. (20 gms.)

Water ... 64 ozs. (1,600 c.c.s.)

The gelatine is first softened in the water, and A and B are then mixed together and boiled for a few minutes. To the cold mixture are stirred in—

Methylated spirit 5 ozs. (125 c.c.s.)
Carbolic acid ... 25 minims (1·3 c.c.s.)

This is a good cold paste, which sticks and keeps fairly well.

Starch-Dextrine.

| Water (cold) | 5 ozs. |
|------------------------------|--------------------------|
| Starch | (1,000 c.c.s. 60 grs. |
| Dextrine, best | (27 gms.) 2 ozs. |
| white | (400 gms. |
| Sodium carbon- ate, cryst | 6 grs. (2.7 gms.) |
| Oil of cloves | 8 minim |
| 10.7 | (3 c.c.s.) |

The ingredients are dissolved and well mixed together in the order given, so as to form a milk like fluid quite free from lumps. This is gradually brought to the boil (stirring all the time) and then poured into suitable jars, which it

should nearly fill. When cool the surface skin is taken off and the jars well stoppered. In one or two days' time the mixture should have set to a smooth white paste, of excellent keeping quality. The sodium carbonate is required principally to neutralise any residual acid in the dextrine. Less than the quantity indicated may be found sufficient. When set, the paste should be either neutral or slightly alkaline to litmus paper.

Shellac Mountant.

A strong solution of shellac in methylated spirit, or better, rectified spirit, is thinly applied to both mount and print, and the two coated surfaces quickly rubbed into contact. This is a good method of fixing prints to thin mounts in albums, etc.

Fixing Paper to Metal.

| Tragacanth | 26 | 2 grs. |
|------------|-------|------------------|
| Gum arabic | (60 g | ms.) 148 grs. |
| XX7-4 | (240 | gms.) |
| water | | OZS. |

Mounting on Glass.

Prints on gelatine printing paper may be mounted face down on glass with a solution of gelatine. (See below.) Prints mounted in this way were formerly largely sold as "opalines."

 Nelson's No. 2 ... 1 oz. soft gelatine
 (30 gms.)

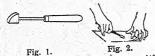
 Water ... 10 ozs. (300 c.c.s.)

The gelatine is soaked in the water, and liquefied by standing the vessel in hot water. The solution is thinned down until nearly as thin as water. Print and glass are immersed, removed together, and squeegeed together.

Dry Mounting.

In this process a sheet of specially prepared dry mounting tissue paper is placed between the photograph and the mount and pressed together in a heated It is emphatically the press. best mounting method because it not only avoids stretch or distortion of a print and cockling of the mount, but also provides a protective waterproof between the print and the mount, thus preventing the possibility of any impurities in the mount attacking the photographic image.

Tissue is obtainable commercially in large sheets 24 × 20 ins., or in cut sizes. It is manufactured by impregnating tissue with shellac, gum, resin, etc., and requires a temperature of about 150° to 180°F., on the pressure plate to ensure perfect adhesion. The first operation consists of partially attaching a piece of tissue (slightly larger than the print) to the back of the print by stroking it locally with a heated metal fixing-iron



(figs. 1 and 2). The print with its tissue partially attached should then be trimmed together in a desk-trimmer (fig. 3), or by using a sheet of glass or zinc as a bedplate, a celluloid



set-square as a straight-edge and a sharply pointed knife as a cutter (fig. 4). The trimmed print is placed in position on the mount, held firmly with the fingers of the left hand, lifting with the thumb one corner of the print only (not the tissue), and stroking the corner of the tissue with the hot fixing-iron (fig. 5). This operation is repeated near another corner in order to hold the print in position for pressing.



Fig. 5.

MOUNTING BY SPECIAL PRESS.

The mount, with its print loosely attached, is placed face up on a sliding cardboard carrier bed, a sheet of metal (called the cover plate) laid on top, the carrier slid under a special press heated to about 150° to 180°F., and pressed for a dwell of a few seconds from 5 to 20 seconds according to thickness of the print (fig. 6). The carrier

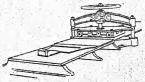


Fig. 6.

is then withdrawn, the mount picked up quickly and while

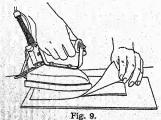
still hot should be bent slightly outwards, so that when cool there is no cockling (fig. 7).



Fig. 7. Fig. 8. Mounting by Hand Iron.

An electrically - heated domestic iron can be used as an alternative to the press, and is particularly suitable for amateur or occasional use. There is available a special box-shape mounting iron which has provision for inserting and heating the fixing iron. (fig. 8.)

The print is tissued, trimmed and "touched down" to the mount in the usual way, and a piece of plain paper a trifle larger than the picture is placed on top. The iron is then heated to 150° to 180°F, and drawn slowly across the surface of the paper with a firm pressing action (fig. 9). This should be



repeated several times until the print is evenly mounted. A sheet of thin metal, or an uncreased piece of aluminium foil can also be used as a "buffer" between the print and the mounting iron.

Mounting with Border Tints.

A photograph can be drymounted on a plain mount

showing a surround tint by "touching down" the tissued and trimmed print to a piece of paper of suitable colour which has already been tissued on the back. The tint is then trimmed all round, leaving the required border surround, touched down to the mount (see fig. 10), and



Fig. 10.

hot pressed all together, giving about double the time of "dwell" than with a singly-mounted print. Border paper tints of great variety of colour, coated on the back with dry-mounting adhesive, are obtainable commercially from all tissue manufacturers. Two or more border tints can be built up on a mount by the use of these tints.

If, after mounting, the tissue sticks to the mount but comes away from the print, the heat is too great. If the tissue sticks to the print, but not to the mount, it means that the pressing heat is insufficient or that the "dwell" time is not long enough. If the print sticks to the mounting cover-plate, it means that the print or mount contained moisture before mounting.

If, when mounting a print of the same size as the heating plate of the press, the corners or edges refuse to stick it means that the plate is not heated evenly, and it is necessary to apply two separate pressures one to each half of the print.

WORKING UP, COLOURING, ETC.

Encaustic Paste.

Purified beeswax ... 50 parts
Oil of lavender ... 30 parts
Benzole ... 30 parts
Gum elemi ... 1 part

Finishing Materials.

MATT BROMIDE PRINTS.

Conté Black Stumping Chalk. Conté Sepia Stumping Chalk. Conté Powdered Black Lead. Conté Powdered Charcoal. Velvet Black or Intense Black Pastel (finest soft).

Prepare the bromide print by first rubbing over with pumice flour with a tuft of wool or flannel in a circular manner, and remove with another piece of wool or duster.

Mix the chosen powder with pumice flour to the tint required and apply with a stump or tortillon. For picking out lights use putty rubber. For sharp lines, use conté crayons in cedar. Special pencils are sold for sulphide-toned prints. If the finish is slight and the powder lightly applied it can be fixed by steaming the print.

GLOSSY BROMIDE PRINTS.

For invisible finishing on glossy paper apply a few grains of spirit nigrosine black, dissolved in "methylated finish," with a rag or brush. In order to match a print, tone the black with Bismarck brown.

Preparing for Colouring.

GLOSSY BROMIDE AND P.O.P.

Rub the prints lightly with a tuft of wool slightly moistened with artists' purified ox-gall.

COLLODION PRINTS.

Fluid extract of 1 dram quillaia (5 c.c.s.)

Water ... 1 oz. (40 c.c.s.)

Alcohol ... 1 oz. (40 c.c.s.)

Oil Colours.

For transparent oil colouring special sets of colours are supplied by the principal photographic dealers. Medium for applying to the surface of the prints is supplied with the colours, a special medium being necessary for each manufacturer's colours.

Ordinary artists' oil colours may be used, applied with a piece of soft rag for large areas or tufts of cotton wool or brushes for the smaller details. The list of water colours given will apply equally to oil colouring, excepting that all oil colours are practically transparent if they are used without the admixture of white body colour.

A suitable medium for preparing the surface of the print, may be ordinary megilp thinned with turpentine, or turpentine mixed with about one-third of its volume of linseed oil. Only a trace of medium should be applied.

Water Colours.

For water colour work, a light print is desirable and, for portraiture particularly, a warm brown tone. Some may prefer a deeper print, but that has a tendency to degrade the colouring in the shadows, though it must be conceded that it provides better modelling in the lights.

Artists' Water Colours.

Ordinary artists' water colours may be used for bromide prints. If matt prints, or those with only a slight sheen are used, no preparation is necessary. print should be thoroughly moistened and then washes of colour can be applied as on ordinary drawing paper. There is, however, a serious drawback. A second wash of colour cannot be added over a tint previously applied. If any additional depth is required, or any details or modelling to be added, it can only be done by very careful and laborious stippling, and this requires skill and patience. If the colouring is not satisfactory it can be instantly removed by means of a wet sponge.

The following are suitable colours, they are taken from the list issued by one of the principal makers as permanent colours; they are all transparent.

Alizarin Scarlet, Scarlet Madder, Rose Madder, Scarlet Lake. Burnt Sienna, Burnt Umber, Raw Sienna, Raw Umber, Charcoal Grey, Paynes Grey, Prussian Blue, Antwerp Blue, Cobalt Blue, French Ultramarine. Naples Yellow, pale and deep, Cadmium Yellow, Green Oxide of Chromium, Lemon Yellow. Lamp Black and Ivory Black, are useful but they can scarcely be classified as transparent. Yellow Ochre, too, is a useful colour, but must be used in pale tints as a deep wash is not very transparent.

Transparent Water Colours.

Although artists' water colours are classified as "transparent" when applied to drawing paper they are not fully transparent when applied to a photographic print. A deep wash would practically obscure the photographic image.

Transparent colours specially prepared for colouring photographs are supplied. They are really dyes which stain the gelatine, and they are so transparent that the photographic image, seen through the colour, loses neither the modelling nor the character. The print should be prepared by thorough moistening as described for using artists' colours: washes can then be applied quite easily. radical difference between the two methods of colouring is that with these colours, one tint can be applied over another and a colour built up to any desired strength or brilliancy. alternatively, shading or modelling can be strengthened or modified to any desired extent, after the main tints have been applied. The colours cannot be removed after once drying: they can be lightened by soaking the print . in water, but that is all. most satisfactory method of working is to build up to the required depth by a succession of pale washes. These fluid transparent colours can be mixed to produce intermediate tints in the same manner as with artists' colours, though a preferable plan will frequently consist in applying alternate washes of the different colours. do not mix well.

Fixative (Crayon and Pastel).

A. Mastic 24 grs. (1.55 gms.)

Amyl acetate ... 3 ozs. (85 c.c.s.)

Dissolve by agitation, and allow to stand for some hours before use.

B. Celluloid ... 7 grs. (0.45 gm.)

Amyl acetate ... 3 ozs. (85 c.c.s.)

Dissolve by agitation. Mix A and B when both are clear, and keep in tightly-corked bottle. Apply with spray diffuser.

Spotting Bromide Prints.

Mix together Payne's grey and Indian ink (the colour should match that of the film.) For sepia, Indian ink and burnt umber.

Spotting P.O.P. Prints.

Add a little carmine to the above. When mixture is dry (on the palette), work in a strong solution of gum, rubbing the brush one way only, to avoid making air-bells. If the prints are to be enamelled or glazed by stripping after spotting, then artists' oil colours with benzole in which gum dammar

has been dissolved, or water colours, may be used with shellac water varnish. "Negative Varnishes.")

Air-Brush Colouring.

A method of colouring extensively employed is applying colour in the form of a fine spray by means of the air brush. Liquid water colours are used specially prepared by artists' colourmen, and, unlike ordinary colours applied by hand, a second tint can be applied over a first, though care has to be taken to avoid moving the first tint, and it is preferable to apply the colour to the full depth required in one operation. In this method the colour is applied to the dry print.

A variation of this process is the use of opaque water colours for working up prints for photoprocess reproduction. Black, white, and various shades of grey only are employed; and backgrounds, perfectly even in tone, or shaded as required, as well as flat tones in photographs of machinery, etc., are easily obtained of a quality very difficult to obtain in working

with a brush.

LANTERN SLIDES.

Lantern plates fall into three main groups, viz.:

Rapid (Black-tone).

These require to be handled in the dark room by bright yellow safelight. In general they give black tones. Some varieties, however, allow warm tones to be obtained with ease. Especially suitable for printing by reduction, and when the closest tone reproduction is desired.

For a cold black tone and with a normal, correctly exposed negative, an exposure of about 5 secs. will be required at three feet from a 16 c.p. bulb. Any standard plate developer (e.g., amidol, hydroquinone, metol-hydroquinone, etc.) may be used.

Slow (Warm-tone).

Of slower speed, but still preferably used in the dark These plates give a rather stronger contrast and areparticularly adapted for making slides of warm colour, ranging from brown to red. The exposure requires to be about four times that for a black-tone plate. When warm brown or red tones are desired, the exposure is increased and development carried out in a developer heavily restrained with bromide.

Gaslight, etc.

Plates of slow speed, for use in ordinary rooms under conditions as for gaslight-paper printing, giving vigorous contrast and allowing of a wide range of warm tones by direct development. Suitable printing (by contact) negatives which are excessively soft in contrast. At six inches from a bulb the exposure 32 c.p. required to give a normal (coolblack) tone with a correctly exposed negative will be in the neighbourhood of 45 seconds; and with an appropriate M.Q. or amidol developer (as compounded for gaslight paper), development takes about 30 seconds to 1 minute at 65° F.

When an M.Q. solution containing a large proportion of bromide is employed to obtain warm tones, the exposure is increased up to about five times, development then requiring about 2½ minutes.

In addition to the above, there are a few special varieties, notably the lliford "Alpha" lantern plate, which gives a very wide range of tones by development.

Developers for Warm Brown Tones on Chloro-Bromide Plates.

following \mathbf{T} he developing formulæ are those used and advocated by prominent expert makers of lantern slides. Each will produce slides of very great transparency and rich quality with certainty. The results are distinctly superior to those produced by using either ammonium carbonate or thiocarbamide, both of which tend to give a semi-opaque effect. A good slide should have a very transparent image.

No. 1. Pyro-Ammonia. E. Dockree

A. Pyro 80 grs. (18.3 gms.)

Sodium sulphite, 220 grs. (50 gms.)

Sulphurous acid 420 mins.

Bistilled water to 10 ozs.

B. Ammonia · 880 150 minims (31·2 c.c.s.)

Ammonium 250 grs. (57 gms.)

Distilled water to 10 ozs.

The working solution is prepared by taking equal parts of each solution.

Hydroquinone-Rodinal. I. W. Shaw

A. Hydroquinone

Soda sulphite

Citric acid ...

Potass. bromide

160 grs.
(16-7 gms.)
2 ozs.
(91 gms.)
60 grs.
(6-25 gms.)
30 grs.
(3-12 gms.)

Water, to make 20 ozs. (1,000 c.c.s.)

B. Sodium hy- 160 grs. (16 or gms.)

Water, to make 20 ozs. (1,000 c.c.s.)

For use, mix as follows :--Solution A 120 minims (24 c.c.s.) Solution B 120 minims (24 c.c.s.) Rodinal (con-5 minims centrated) (1 c.c.) Potass, bromide 60 minims (12 c.c.s.) (10% soln.) Water ... 1 oz. (100 c.c.s.)

Development 2-21 mins. Prvo-Soda H. W. Bennett.

100 grs. A. Pyro ... (23 gms.) 800 grs. Sodium sulphite, crystal (183 gms.) Citric acid 50 grs. (11.5 gms.) Potassium 100 grs. Bromide (23 gms.) Water, to make 10 ozs. (1,000 c.c.s.) B. Sodium carbon-800 grs. (183 gms.) ate crystal Water, to make 10 ozs. (1,000 c.c.s.) C. Potassium bro-

(1.000 c.c.s.) For normal development, take 1 part A; 1 part B; 2 parts water. If still warmer tones are required, take 1 part A; 1 part B; 1 part C; 1 part water. Time of development 4-8 minutes according to the tone.

mide

Water, to make

100 grs.

(23 gms.)

10 ozs.

Chlorquinol.

For Slow Plates.

An excellent developer for warm tones is as follows:---Soda sulphite, d oz. cryst. (25 gms.) Soda carbonate. 1 oz. (25 gms.) cryst. Potass. bromide. 100 minims (20 c.c.s.) 10% solution Chlorquinol 30 grs. (7 gms.) Water 10 ozs. (1,000 c.c.s.)

Development should from 21 to 4 minutes at 65° Fahr.

For warm-brown tones add 25 minims of 10% potass bromide solution to each ounce of the above Chloroquinol developer (5 c.c.s. to every 100 c.c.s.) and give three times the normal exposure.

For reddish tones add 50 minims of 10% potass. bromide solution to each ounce of the above Chloroquinol developer (10 c.c.s. to every 100 c.c.s.) and give 8 times the normal expo-

Thiocarbamide.

The thiocarbamide developer for lantern slides is one which yields a wide range of colours by simple development, ranging from magenta red through warm brown, cool brown, purple to blue and bluish-grey and on to neutral grey and black. The warmer colours are obtained by greatly increased exposure.

Stock Solutions.

| A. | Metol | 44 grs. (4.6 gms.) |
|------|-----------------------------|---------------------------|
| | Hydroquinone | 22 grs. (2·3 gms.) |
| | Soda sulphite cryst. | 1 oz. (45·5 gms.) |
| | Soda carbon- ate, cryst. | 1 oz. (45.5 gms.) |
| | Water, to make | 20 ozs. (1,000 c.c.s.) |
| В. | Ammonium carbonate | 2 ozs. (91 gms.) |
| | Ammonium bromide | 2 ozs. (91 gms.) |
| | Water, to make | 20 ozs. (1,000 c.c.s.) |
| C. | Thiocarbamide | 66 grs. (6.9 gms.) |
| | Ammonium bromide | 22 grs. (2·3 gms.) |
| | Water, to make | 20 ozs. (1,000 c.c.s.) |
| 10 0 | | 100 |

The chief difficulties in thiocarbamide develoyment are (1) judging the correct density, (2) obtaining the desired colour.

The slide passes through a regular sequence of colour changes, beginning with vellow passing thence to red, purple, blue-grey and ultimately black, although it is impossible to follow these changes with the eye during development. The problem thus becomes one of so adjusting, exposure and developer that the correct density is reached at the same time as the desired colour.

Working developers: For warm-brown tones use A, 14 parts; B, I part; C, I part. For blue-grey tones, use A, 12 parts; B, 3 parts; C, 1 part. For warm black tones, use A, 10 parts; B, 5 parts, C, 1 part.

Toning.

(1) For a fine brown tone, bleach in mercuric chloride solution (as used for intensifi-

cation), wash and dry.

(2) Bleach in one of the following solutions, rinse, remove the bichromate stain with weak potass. metabisulphite solution, wash and dry.

A. Potass. 200 grs. bichromate (20.8 gms.) Hydrochloric 1 dr. 26 mins. acid (9 c.c.s.) Water, to make 20 ozs.

(1,000 c.c.s.) B. Potass. 200 grs. bichromate (20.8 gms.) Potass. 100 grs. bromide (10.4 gms.) Nitric acid 1 dr. 26 mins. (9 c.c.s.)

Water, to make 20 ozs. (1,000 c.o.s.)

C.—Same as above, save that potassium iodide is used in place of bromide.

On exposure to bright daylight, the bleached slide gradually darkens. A slide bleached in A tends to warm brown: one bleached in B becomes cool, grey; and one bleached in C. brown in colour.

Sulphide Toning.

The indirect sulphide process -bleaching and sulphidingas described for toning bromide prints, may be used for toning lantern slides which have been developed to a cool or warm black. This process produces a fine rich brown colour transparent in character.

Masking.

Prepare strips of black " needle " paper 31 ins. long, and of various widths from \$ ins. to 1 in.

One edge at least must be

perfectly clean cut.

Lay the slide, film side up, on white paper, moisten the surface of a suitable strip with the tongue and affix it on the slide so as to mask off to the desired margin.

A sheet of ruled paper laid under the slide helps in placing

the strips squarely.

Apply other strips to the remaining three slides and trim off projecting edges with scissors.

Finally affix a white spot or disc on the two upper corners of the face of the slide and proceed to the binding.

Binding.

Select a brand of binding strips of thin, tough paper, coated with strong adhesive, and use the strips in one full length (131 ins.).

Lay the strip out, gummed side down and moisten the back,

When the strip is limp, turn it over, just moisten the gummed side and lap the strip, face up, on a yielding surface, e.g., two

thicknesses of blotting paper. Cover the slide with a thin and carefully cleaned cover-



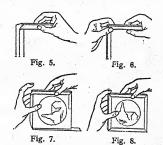
Fig. 2. glass, place one corner on the gummed strip (Fig. 1) and press it firmly down.

Turn the slide over on edge (Fig. 2) and over again (Fig. 3).



Fig. 3. Fig. 4.

At each movement press the slide firmly down on the strip and run the finger along the edge only of the strip to cause it to adhere to the slide (Fig. 4).



Now press the sides of the strip firmly against the glass, pushing the top end of the upright strip away from the glass (Fig. 5).

Continue in the same way with each corner as in Figs. 5, 6 and 7.

The slide completely bound in this way is seen in Fig. 8.

A Simple Method.

An alternative method extensively used is to use four short strips for binding, each one just under 31 ins. long, applying them separately.

COLOUR PHOTOGRAPHY.

Dufaycolor Flat Film.

Instructions for use.

LOADING.

During loading and unloading the film should be handled in complete darkness.

The film has to be exposed through the base, which must therefore be kept free from finger marks; handle by the edges only. The film is packed six sheets in a box, all facing the same direction; each piece of film has hinged to it at one end a sheet of black paper, of exactly the same size, which covers and protects the emulsion coated surface; this paper should not be removed until immediately before development, when it should be opened out and a gentle sideways pull will cause the adhesive strip to peel evenly off the film without any tearing.

The ordinary film sheath is a convenient method of holding the film for loading in the dark slide; insert first that end of the film which is attached to the backing paper. For single dark slides the film may be placed with its paper protector in contact with a sheet of thin glass or best quality cardboard and the edge attached with narrow strips of adhesive tape. In some double dark slides the film is best placed behind a sheet of best quality flat glass, the thickness of glass being compensated for by reversing the focusing screen so that the smooth side is towards the lens.

EXPOSURE INSTRUCTIONS.

To obtain the best results, accuracy in exposure is essential. The following table gives exposure for out-door use for the film in conjunction with its Daylight filter.

| Beach and sky scenes Outdoor subjects in sunlight | F 1/200 | f/5·6 1/100 | f/8 1/50 | $f/11 \\ 1/25$ | $f/16 \\ 1/10$ |
|--|-------------------------------|---------------------|------------------------------|-----------------------------|----------------|
| except the above Outdoor subjects on bright days | 1/100 | 1/50 | 1/25 | 1/10 | 1/5 |
| with sun obscured Outdoor subjects on dull days | $\frac{1}{50}$ $\frac{1}{25}$ | $\frac{1/25}{1/10}$ | $\frac{1}{10}$ $\frac{1}{5}$ | $\frac{1}{5}$ $\frac{1}{2}$ | $\frac{1}{2}$ |

These exposures are correct for the middle hours of the day during the summer months, for other times and seasons multiply by the following factors:—

| Time of day (not summer time). | April, May, June, July, August. | March, Sept. | | Nov, Dec |
|--------------------------------|------------------------------------|-----------------|---|----------|
| a.m. p.m. | | | | 3 |
| 10 to 2 | 1 | 2 | 2 | 4 |
| 8-10 or 2-4 | 1 | 2 | 8 | |
| 6-8 or 4-6 | 2 | 4 | | - |

In Daylight, Dufaycolor Film requires approximately twice the exposure of Selo Roll Film or four times that of Selochrome Roll Film, when the exposure on the latter materials have been arranged to give well exposed negatives. Further, Dufaycolor is slightly slower than the Ilford Special Rapid Panchromatic Plate to daylight and approximately one-third the speed of the latter to half-wat light when the film is used with its appropriate filter and the plate without a filter.

The use of the Ilford Photo-Electric Exposure Meter is strongly recommended for determining exposures with Dufaycolor Film and will be found to be of immense advantage by almost eliminating errors of exposure.

PROCESSING INSTRUCTIONS.

Two alternative methods are given according to whether it is desired to watch the first development. In commercial work where standardised exposures can be given the Constant First Development is recommended but for the outdoor worker or amateur the Factorial Development may be preferable. Whichever method is employed

great care must be taken to avoid fogging; uniform fogging (e.g., by an unsafe darkroom lamp) is not apparent as veiling but causes a general loss of density and flattening of the image.

CONSTANT FIRST DEVELOPMENT METHOD.

Work in total darkness or with an Ilford "G" Safelight shielded so that the direct light cannot fall on the film.

Immerse in one of the following developers for 3 minutes at 65° F. (2½ minutes at 70° F. or 2 minutes at 75° F.), vigorously rocking the dish the whole time; agitation increases the brilliance of the transparencies. Formula A gives slightly softer results than B.

DEVELOPER A.

| Metol | 65 grs. |) (| 6.5 gms. |
|--------------------------|------------|--------|-------------|
| Sodium sulphite (cryst.) | 2 ozs. | | 100 gms. |
| Hydroquinone | 20 grs. | > or \ | 2.0 gms. |
| Potassium bromide | 25 grs. | | 2.75 gms. |
| Ammonia (sp. gr. 880) | 105 minims | 1 | 11 c.c.s. |
| Water to | 20 ozs. |] | 1000 c.c.s. |

DEVELOPER B.

| Metol | 65 grs. | 6.5 gms. |
|---------------------------|---------|---------------|
| Sodium sulphite (cryst.) | 2 ozs. | 100 gms. |
| Hydroquinone | 20 grs. | 2.0 gms. |
| Sodium carbonate (cryst.) | 2 ozs. | or < 100 gms. |
| Potassium bromide | 25 grs. | 2.75 gms. |
| Potassium Thiocyanate | | |
| (Sulphocyanide) (pure) | 80 grs. | 9.0 gms. |
| Water to | 20 ozs. | 1.000 c.c.s |

Used developer may be employed for the second development process (see below) but not for the first development of another film.

FACTORIAL FIRST DEVELOPMENT METHOD.

Desensitising:—First immerse in total darkness in a 1:2,000 solution of Pinacryptol Yellow for 2 minutes, rinse for 1 minute and transfer to the developer.

After desensitising the Ilford Iso Safelight (Red) with 25 watt lamp, should be employed; the film should not be examined at less than 3 ft, from the safelight.

Take two dishes and in the first put 1 part of either of the developers given above and 3 parts of water, and into the second dish pour full strength developer. Place the film in the weak developer and note the time required for the first appearance of the image (ignoring the brightest highlights). Then transfer the film to the full strength developer and continue development preferably in darkness) for a period equal to 3 times the time in the first bath. Continuous agitation by rocking the dish is desirable throughout the whole period of development.

BLEACHING BATH.

After development, by whichever method is chosen, rinse the film and transfer to the following bath for 5 minutes until all the negative silver image is dissolved.

| Potassium permanganate | |
|------------------------|-----------------------------|
| Conc. sulphuric acid | 100 minims > or < 10 c.c.s. |
| Water | 20 ozs.] [1,000 c.c.s. |

It is important to agitate the film during the bleaching operation.

White light may be turned on after the film has been at least 15 seconds in the bleaching bath and all subsequent operations may be carried out in this white light.

CLEARING BATH.

Rinse and remove the brown stain in the following bath:

Potassium metabisulphite $\frac{1}{2}$ oz. $\frac{1}{20}$ or $\frac{25}{1,000}$ c.c.s.

SECOND EXPOSURE.

Rinse for 2 minutes and expose the emulsion side of the film for 20 to 30 seconds at one foot from a 100 watt lamp. Too much exposure is preferable to too little, but do not expose to daylight.

REDEVELOPMENT.

Redevelop for 4 to 5 minutes in the first developer (full strength) or in any rapid working M.Q. developer.

FIXATION AND WASHING.

Rinse and immerse for two minutes in an ordinary or acid hypo fixing bath. Wash in running water for 15 minutes.

DRYING.

Carefully wipe the back with wet cotton wool to remove surplus moisture and hang up where nothing can touch the surface,

It is not necessary to varnish Dufaycolor transparencies.

AFTER TREATMENT OF DENSE OR THIN TRANSPARENCIES.

Applicable only when the Constant First Development method has been employed, when errors in exposure can be partially compensated for by reduction or intensification. Factorial development makes the same compensation during the development.

REDUCTION.

Underexposure leads to dense transparencies. These may be reduced by immersing in the following bath:—

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Soln. B. Potassium ferricyanide 50 grs. $\begin{cases} 1 \text{ gm.} \\ \text{Water ...} \end{cases}$ or $\begin{cases} 1 \text{ gm.} \\ 200 \text{ c.c.s.} \end{cases}$ For use take equal parts of A and B.

It is important that these concentrations be adhered to. The carbonate increases the life of the bath but may be omitted when the bath is used immediately after mixing. The film should be removed from the bath immediately the density appears correct by visual examination; wash for 10-15 minutes.

INTENSIFICATION.

Over-exposure results in thin transparencies lacking in colour. These may be intensified by soaking the film in water for a few minutes and then immersing in the following bath until the desired density is obtained.

(b) Silver nitrate 150 grs. \ Water (distilled) 20 ozs. \ or \ \ 200 c.c.s.

For use mix immediately before required equal parts of A and B.

The dishes to be used should first be rendered absolutely clean by treating with a 10 per cent. solution of nitric acid and thoroughly rinsing in water. After intensification the film should be washed for 10 to 15 minutes.

Selo Panchromatic Cine Negative Film.

This is a superspeed panchromatic emulsion of very fine grain and high green and red sensitivity and being double coated, the emulsion possesses a very high latitude. It is coated on an antihalation grey base.

The following are the filter factors to daylight and ½-watt light for various Ilford filters:—

| Filter. | | Tricolou Green. | | Alpha. | Beta. | Gamma. | Iso. | Delta. |
|--------------|-----|--------------------|-----|--------|-------|--------|------|--------|
| Daylight | 6·5 | 5·5 | 4·5 | 1·4 | 1·7 | 3·2 | 1·5 | 2·0 |
| } watt light | 10 | 5 | 2 | 1·1 | 1·3 | 2·4 | 1·2 | 1·3 |

Any fine grain developer recommended for cine processing will be found satisfactory but the following fine grain M.Q.-Borax formula is especially recommended:—

| Metol | ••• | | | | | 20 gms. |
|----------|---------|-------|-------|---------|----|------------|
| Hydroqui | none | | | | , | 50 gms. |
| Sodium s | ulphite | (anhy | rd.) | ••• | | 1,000 gms. |
| Borax | ••• | • • • | | | | 20 gms. |
| Water to | ••• | | | | | 10 litres. |
| Time of | develop | ment | 10-20 | minutes | at | 18° C. |

Selo Cine Positive Film.

This can be supplied on either (acetate non-flam.) or nitrate base which can be tinted to order, a clear track being allowed for the sound record.

This is an extremely fine-grained emulsion of excellent gradation and very uniform quality. Any normal cine positive developer is recommended and any desired gradation can readily be obtained by varying the time of development.

| Metol | | | 3 gms. |
|----------------------------|-------|---------|------------|
| Sodium sulphite (anhyd.) | | | 400 gms. |
| Hydroquinone | | | 60 gms. |
| Sodium carbonate (anhyd.) | • • • | • • • | 190 gms. |
| Potassium bromide | | | 9 gms. |
| Citric acid | | | 7 gms. |
| Potassium Metabisulphite | | | 15 gms. |
| Water to | | | 10 litres. |
| Normal time of development | 5-7 | minutes | at 18° C. |

Lumière "Filmcolor Films."

A guide to exposure is: Give 60 times the exposure necessary for a plate of 250 H. & D.

Ample exposure should always be given, as there is no remedy for under - exposure, whereas over-exposed films can be easily intensified; in practice many workers prefer to over-expose films and intensify them, as the results are more brilliant. The special filters supplied by Lumière must be used.

Two solutions only are used—developer (used also for redevelopment) and reversing solution. There is no need to fix.

In making the developer stock solution, dissolve the Quinomet in warm water (about 100° F.), add the sulphite, and then, when cold, the ammonia.

Working developer: Stock solution, I part; water, 4 parts.

Develoter—Stock Solution.

| Water, distilled | 35 ozs. |
|------------------|----------------|
| | (1,000 c.c.s.) |
| Metoquinone | doz. |
| (Quinomet) | (15 gms.) |
| Soda sulphite, | 31 ozs. |
| anhydrous | (100 gms.) |
| Liquor am- | 9 drs. |
| monia, ·920 | (32 c.c.s.) |
| Potass. bromide | 240 grs. |

(16 gms.)

For half-plate, place in develthe following oping dish solution :-

Stock solution A 1 oz. above (20 c.c.s.) Water ... 4 ozs. (80 c.c.s.)

Place the film therein, and count the number of seconds from the moment of entering until the appearance of the first outlines of the image (the sky should not be taken into consideration). As soon as the outlines appear, note the number of seconds, multiply it by 10 and you will get the total duration of development.

The development must begin out of reach of the light of the lantern which must be fitted with Virida paper; but after 10 or 12 seconds; the film may be rapidly examined.

Reversal of the Image.

Following the development and after a short washing in running water, immerse the film in a dish containing 3 ozs. of the reversing solution and take the dish out in full light. The film which was opaque, clears, and the colours become more and more visible by transmitted light. After half to oneand-a-half minutes, when the plate bears no more trace of a negative image, take it out of the dish and wash it for about 30 seconds in running water.

REVERSING SOLUTION.

| C. Potassium | 30 grs. |
|-----------------------|----------------|
| permanganate* | (2 gms.) |
| Sulphuric acid | 3 drams |
| | (10 c.c.s.) |
| Water | 35 ozs. |
| | (1,000 c.c.s.) |
| * Or Potace highromat | • |

This solution will keep for a short time, but should not be used if cloudy.

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Immediately the film covered by the C solution daylight may be used.

Second Development.—The film is then re-developed in full daylight, using the solution which has served for the first development (kept in the dish without special precautions). When the high-lights are completely darkened (about 3 or 4 minutes) the film is washed for 3 or 4 minutes, and immediately placed to dry. Fixing is unnecessary unless the film is intensified.

Agfacolor Plates and Agfa Ultra Films.

As a guide to exposure, the Agfacolor plate should be given 30 times the exposure required by a normal plate of speed 18° Scheiner, while the Agfa Ultra film should receive 4 times the exposure of a plate of speed 18° Scheiner.

Development is undertaken in a Metol formula of the following composition:-

Concentrated Stock Solution.

| Metol (Agfa) | 115 grs. |
|------------------|--------------|
| | (13 gms.) |
| Sodium Sulphite | 2 ozs. |
| (Anhydrous) | (100 gms.) |
| Potass. bromide | 48 grs. |
| | (5.5 gms.) |
| Ammonia (sp. gr. | 43 drams. |
| 0.91) | (30 c.c.s.) |
| Water | 18 ozs. |
| | (900 c.c.s.) |

In making up, dissolve in the order given at a temperature of 110° Fahrenheit (35° C.) and allow to cool. The ammonia is then added, and before use, the solution should be filtered. The working solution for each exposure should be made up of 1 part of stock solution to 3 parts of water.

The working developer is used for the re-development, but must not be used again. The temperature of the working developer must not be higher than 65° F. If it is too warm, it is liable to cause softening and frilling of the film. With correct exposure, development is complete in 3 minutes for plates and 4 for Ultra films.

Development having been completed, the plate is rinsed for about one minute (not longer) in running water, not under the tap. It is then put in the reversing bath.

Stock Solution for Reversing Bath,

Potass. bichromate 1 oz. (50 gms.)
Sulphuric acid, 2 ozs. (100 c.c.s.)
Water ... 20 ozs. (1,000 c.c.s.)

One part of this stock solution is mixed with 10 parts of water to firm the reversing bath, which must not be warmer than 65° F. After one minute in this bath, the light may be turned on, and as soon as it is seen, by transmitted light, that the black silver image has been removed, the plate is taken out and at once put to wash for about 3 minutes in running water. It is then re-developed in strong light in the same developing solution as used in the first instance, and is then well rinsed and put aside to dry.

Desensitising.

This is best carried out in a bath of Pinacryptol Yellow, of a strength of 1:2,000. The plate must remain in this solution for 2 minutes in darkness. It is then transferred to the developer without intermediate washing and development continued in the usual manner, by red light, but for one minute longer than the usual time.

Finlay Colour Process.

This is a screen-plate process on the principle of the Joly process. The process was formerly known as the Paget, and at a later date was marketed under the name of Duplex. But the Finlay colour plate is a great advance in manufacture and allows shorter exposures than other colour processes.

The exposure is made on one of a variety of special panchromatic plates of varying speeds, according to the selected make of plate which is placed in the dark slide behind the Finlay taking screen with a Finlay compensating filter on the lens. The speed of each selected panchromatic plate when exposed through the Finlay screen and the Compensating filter is reduced approximately five times that of black-and-white. Therefore exposures in the neighbourhood of 1/100 of a second at f/4.5 inland, and 1/200 of s second at f/4.5 by the sea, may be obtained in bright sunshine.

Panchromatic plates should be developed in a soft working developer, such as :—Metol. The following formula works well. When developed the plate is fixed in the usual way.

Metol Developer.

A. Metol ... (35 gms.) 2½ grs. Sodium sulphite (118 gms.) cryst. Water, to make 20 ozs. (1,000 c.c.s.) B. Sodium car-31 ozs. (165 gms.) bonate cryst. Potass. bromide 16 grs. (1.5 gms.) 20 ozs. Water, to make (1,000 c.c.s.)

For use, take equal parts of above stock solution and water. Development is complete in 2 minutes at 65° F. In printing, a Finlay positive plate is placed in contact with the finished negative in an ordinary printing frame and exposed to a bare (not diffused) half-watt lamp. At 6 ft. from an ordinary 16 c.p. half-watt lamp, exposure is 5 seconds. In developing the positive plate a more contrasty developer should be used, e.g., metol-hydroquinone,

A. Potassium doz. Metabisulphite (25 gms.) Hydroquinone oz. (25 gms.) Potass. bromide oz. (25 gms.) Water, to make 20 ozs. (1,000 c.c.s.) B. Caustic potash 1 oz. (50 gms.) 20 ozs. Water (cold) ... (1,000 c.c.s.)

For use, equal parts A and B.

Development is complete in I minute. Fix in the usual way.

When the positive plate is dry, it is brought into correct register with the Finlay viewing screen, the picture appearing in its correct colours. The two plates are then bound together.

Finlay Non-Parallax Colour Screen.

This screen is a further refinement in the process, allowing of the making of colour transparencies which do not change colour according to the angle from which they are viewed.

The screens are coated with an emulsion of the gaslight kind and require to be handled in yellow or light green light. In printing the screen is registered with the negative as follows:-The sensitive colour screen is placed emulsion side in contact with the negative, and, by means of the registering edges at each end of the negative, the negative and positive plate are gently moved until the colours are seen to be complementary when viewed by the printing light. The screen and negative are clipped together on all four sides with bull-dog clips, placed on a piece of black board (negative upwards) and exposed to a bare metal-filament halfwatt bulb of 100 watts at about. 3 ft. distance. With average negatives the exposure is about Under exposure one minute. should be avoided.

CINEMATOGRAPHY.

The number of different negative, reversal and positive stocks at present available, and the fact that each manufacturer markets at least one or more separate emulsions for specialised purposes, makes the question of processing equally specialised.

The following information has been collated with the kind assistance of the technical and research departments of the manu-

facturer mentioned in each case.

Of interest is the graph showing two curves, one for stagnant and one for agitated development in a developer of the same formula and at the same temperature, on page 400, which is reproduced from the Bulletin NF-4 of the Du Pont Film Mfg. Corp. Note should also be made of the present practice of developing to a definite gamma, rather than the older hit-and-miss inspection method. Other points of interest are indicated in the individual formulæ.

Agfa Limited.

A considerable number of specialised materials are available and are listed below, with their specific usefulness set out against each.

Pankine Type H. Antihalo negative
Pankine Type G. Antihalo negative.
Kinechrom negative...
Special negative

Extra-rapid negative...

Aerochrom negative ...

" R" negative ...
" Bi-pack' negative...

Dupe Positive...

Dupe Negative

"Tf 3" Sound negative

"Tf 4" Sound negative

"Positive Film for Sound Recording"

Sound Negative film "special"

Super-speed panchromatic negative for artificial light exposures.

High speed panchromatic negative for both exterior and interior working.

Highly orthochromatic negative.
Slightly sensitised orthochromatic negative for exteriors.

Slightly sensitised orthochromatic soft-

working negative, approximately twice the speed of the "Special," but with the same spectral range.

Highly orthochromatic negative of steep gradation and fast speed, specially suitable for aircraft and distant landscape working.

Sensitised for Infra-red.

For subtractive two-colour processes by the bi-pack method.

For the preparation of intermediate master positives by copying.

For the preparation of duplicate negatives

from intermediate master positives.
For the variable-density process, having

great exposure range.

For the variable-width process, and for variable-density with small range of exposure of light intensity (Toerecording process.)

Positive stock with footage numbering for recording by either variable-density or variable-width recording processes.

For either variable-density or variablewidth recording with little exposure range and small light intensity. (Toe Recording.) SUB-STANDARD MATERIALS.

Super-speed panchromatic stock, for Novopan reversal exterior and interior work.

Normal panchromatic reversal

Slower in speed than the Novopan.

negative.

Normal panchromatic A negative material comparable in speed with the Normal reversal. .

Metol ... Formula Hydroguinone 6 gms. No. 5. Sodium sulphite (anhyd.) ... 40 gms. Sodium carbonate (anhyd.) ... 21 gms. Potassium bromide 1 gm. Potassium metabisulphite 1.2 gms. ... Citric acid 0.5 gms.... ... = Water, up to 1,000 ccs. Time, 5 to 6 minutes at 65° F.

Suitable for Kinechrom, Special, Extra Rapid and only developer for Aerochrom.

Machine developer. Fine-grain. Formula Metol ... $8 \cdot 0$ gms. No. 15. ... 12.5 gms. Sodium sulphite (anhyd.) Sodium carbonate (anhyd.) ... 1.2 gms. Potassium bromide ... 0.15 gms. ... Water, up to 1,000 ccs. Time 5 to 8 minutes at 65° F.

Suitable for Pankine types H. & G., Kinechrom, Special, Extrarapid "R" and Bi-pack. Sound recording negative Tf 3 and for soft results on the general "Positive film for sound recording."

Contrast developer (also useful for titles). Formula. No. 22. Metol 0.8 gms. Hydroquinone 8.0 gms. ... Sodium sulphite (anhyd.) ... $40 \cdot 0$ gms. Potassium carbonate 50.0 gms. Potassium bromide ... $5 \cdot 0$ gms. Water, up to 1,000 ccs. Time 5 to 8 minutes at 65° F.

Suitable for "Tf 4" sound negative, and for contrast on the general "Positive film for sound recording"; the only developer for the sound negative film "Special."

Formula IV. Fixing-hardening bath for machine processing. 0.03 kilos. Chrome alum Soda bisulphite lye (38-40 Bé) 0.1 litres. Sodium sulphite (anhyd.) ... 0.017 kilos. Sodium hyposulphite ... 0.34 kilos. Water, up to ... 1,000 ccs. Time. From 3 to 6 minutes.

Where an intermediate hardening bath is recommended, as in the tropics, it is almost essential that the pH value be kept to a constant figure to ensure the maximum efficiency; the activity of chrome alum being decreased by alkali from the developer being carried over.

Formula No. 14. Developer for sub-standard stocks where specially fine-grain is essential.

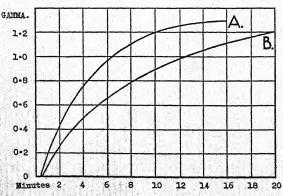
| Metol | | 4.5 gms. |
|---------------------------|-------|-------------|
| Sodium sulphite (anhyd.) | | 85.0 gms. |
| Sodium carbonate (anhyd.) | ••• | 1.0 gms. |
| Potassium bromide | | 0.5 gms. |
| Water, up to | | 000 ccs. |
| Time Approximately 15 r | ninnt | es at 65° F |

Suitable for sub-standard normal panchromatic fine-grain negative. 16 mm.

Du Pont Film Mfg. Corp.

Three negative materials are available in this country, the Regular, Special and Superior, and the same formula is recommended for each. A gamma of 0.7 is stated to be the usual figure to which development is carried, and with agitated development this figure is attained in 3.7 minutes according to the curve "A" in the graph, for the Regular and Special stocks. The Superior needs 4.5 minutes to reach the same gamma. With stagnant development, however, the first two named stocks will need 7.0 minutes to attain the required figure as will be seen from the curve "B"; the Superior needing longer again if a higher figure is required.

| Formula. | Rhodol | | 2.5 gms. |
|----------|--------------------------|--------|-----------|
| | Sodium sulphite (anhyd.) | | 75.0 gms. |
| | Hydroquinone | | 3.0 gms. |
| | Borax | 0 | 5.0 gms. |
| | Water, up to | 1 | ,000 ccs. |
| | Development temperature | 68° F. | |



A = Agitated development at 680F.

B = Stagmant development at 68°F.

From Bulletin NF-4 Du Pont Corporation.

Gevaert Limited.

This company caters for every cinematograph requirement as regards the different gauges of film, and the various types are listed below, with developing formulæ for the various materials.

Standard 35 mm.

Panchromosa ... Panchromatic negative of extreme speed, normal gradation and fine-grain.

Super speed ... Rapid orthochromatic negative.

Normal ... Standard speed negative of orthochromatic type.

Special Fine-grain ... Orthochromatic negative for work requiring extra fine-grain.

"S.T.1." Soundfilm ... Negative for the variable density system with great light fluctuations.

"S.T.2." Soundfilm ... Negative for the variable density system with small light fluctuations, and for the variable area system.

"S.T.O." Positive ... For recording on either system with illuminants of high intensity.

Positive ... For negative printing, B. & W., and in ten colours.

Positive ... Safety-base.

Duplicating film ... For the preparation of dupes, without the use of a screen, very soft.

Duplex anti-halo ... Special positive for the printing of two-colour process colour-films.

Sub-standard. 16 mm.

Panchro Super Reversal Direct reversal material of super-speed.

May also be used as a negative.

Panchro Negative ... Negative of normal speed.

Ortho Reversal... Direct reversal material for general use, orthochromatic quality.

Ortho Negative ... Orthochromatic negative material of very fine grain.

Positive ... Normal type positive suitable for printing and for titling. In B. & W., and

five colours.

Safety Duplicating Of the same general quality as the standard 35 mm. duplicating film, on the standard non-inflammable base for sub-standard use.

Sub-standard. 9.5 mm.

Panchro Super Reversal; Orthochromatic Reversal; Orthochromatic Negative; Positive and the Safety Duplicating Negative. Qualities as for Sub-standard 16 mm.

Sub-standard. 8 mm.

Panchro Super Reversal and Orthochromatic Reversal only. Developers. Standard and sub-standard.

```
Fine-grain borax general negative developer.
                   Metol ...
                   Sodium sulphite (anhyd.) ... 100 gms.
Hydroquinone ... ... 4 gms.
                   Borax ... ... ... 2 gms
Water, up to ... ... 1,000 ccs.
                                                                    2 gms.
                    Time. 8 to 12 minutes at 65° F.
   Suitable for all negative materials listed, also for the sound-film
negative "S.T.1." and for the sound-film positive "S.T.O."
   Developer for sound-film negative "S.T.2."
                   Time. 3 to 8 minutes at 65° F.
   Developer recommended for the "Special Fine-grain" 35 mm.
                   Metol ... ... 1 gm.

      Sodium sulphite (anhyd.)
      30 gms.

      Glycin
      ...
      0.5 gms.

      Hydroquinone
      ...
      0.5 gms.

      Sodium carbonate (anhyd.)
      25.0 gms.

                   Potassium bromide ... ... 1.5 gms.
Citric acid ... ... 1.0 gms.
                   Citric acid ... ... 1.0 gr
Water, up to ... ... 1,000 ccs.
                   Time. 10 to 12 minutes at 65° F.
   Developers for Positive films.
                                            Titles and Contrast Softer results.

        Metol
        ...
        None
        0.5 gms.

        Sodium sulphite (anhyd.)
        25.0 gms.
        50.0 gms.

        Hydroquinone
        10.0 gms.
        5.0 gms.

        Sodium carbonate (anhyd.)
        100.0 gms.
        30.0 gms.

        Potassium bromide
        3.0 gms.

   Potassium bromide ... ...
                                                     3.0 gms.
                                                                     1.5 gms.
1.0 gms.
   Citric acid ... ... None.
Water, up to ... ... 1,000 ccs.
                                                                    1,000 ccs.
   Time. Averaging 4 to 5 minutes at from 60° to 65° F.
   Formulæ and procedure for the Reversal process.
   First development.
                  Solution
No. 1.
                  Potassium bromide ... 8 · 0 gms.
Sodium hyposulphite ... 2 · 0 gms.
Water, up to ... 1,000 ccs.
                Caustic potash (KHO) stick ... 100.0 gms. Water, up to ... ... 1,000 ccs.
Solution
No. 2.
```

The separate solutions are said to keep indefinitely. The working developer is made from $9\frac{1}{2}$ parts of solution No. 1 mixed with one-half part of solution No. 2.

Washing. For 5 minutes.

Reversal (removing silver image.)

Stock Potassium bichromate ... 30 gms. solution. Sulphuric acid (66° Be) ... 33 ccs. Water, up to ... 1,000 ccs.

Note Bichromate is dissolved first and the acid is added to the water; if the water is added to the acid there is considerable risk.

This section of the process is carried out in one part of the stock solution diluted with 5 parts of water, and is continued until all traces of the black silver deposit is dissolved away. This usually takes place in 5 to 10 minutes. After approximately 2 minutes the operation may be continued in white light—not more than 30 to 60 watts of half-watt light at about 3 feet distance. Excessive light will produce too warm a tone in the final positive.

Washing. For 5 minutes.

Bleaching. In a 10 per cent. solution of anhydrous sodium sulphite. The bath may be used until exhausted. All traces of yellow stain should disappear in this bath.

Washing. For 5 minutes.

 Second
 Metol
 ...
 ...
 2 gms.

 development
 Sodium sulphite (anhyd.)
 ...
 20 gms.

 Hydroquinone
 ...
 ...
 3 gms.

 Sodium carbonate (anhyd.)
 ...
 20 gms.

Sodium carbonate (anhyd.) ... 20 gms.
Potassium bromide ... 2 gms.
Water, up to ... 1,000 ccs.
Treatment in this bath is stopped as soon as the desired density

is obtained.
Fixing. In an ordinary acid-fixing bath.
Washing. Thoroughly for half-an-hour.

Kodak Limited.

Following is a list of the various products of this company, and together with them the gamma value to which it is considered normal practice to develop each particular stock. These gamma values are obtained from time-scale sensitometric exposures, the instrument used being the Eastman Type 2B Sensitometer.

Super-X Panchromatic. Grey Extreme speed panchromatic negative. Soft gradation.

Gamma 0.65—0.7.

Super-sensitive Panchromatic.
Grey-base or ivory base.

High speed panchromatic negative with soft gradation.
Gamma 0.65.

Background panchromatic.
Orthochromatic negative.
Sound Recording film
Sound Positive film.
Positive
Gamma 0.4 and 2.0 to 2.40
Gamma 0.4 and 2.0 to 2.40
Gamma 2.0 to 2.40.

In B. & W. and 11 colours—Sonochrome.

Duplicating Positive.

Duplicating Negative.

Gamma 1.8 to 2.2.

Gamma 0.50 to 0.7.

| Developer. | Eastman Fine-grain Motion | picture Developer No. D76, |
|------------|---------------------------|----------------------------|
| • | Metol | 2·0 gms. |
| | Sodium sulphite (anhyd.) | 100 · 0 gms. |
| | Hydroquinone | \dots 5.0 gms. |
| | Borax | 2·0 gms. |
| | Water up to | 1.000 ccs. |

Suitable for all negative stocks.: in use by a large number of film processing laboratories in England and the U.S.A. subject to slight modifications depending on the continuous plant in use. In a diluted form is used for variable-density recording development.

| Developer. | Positive type No. D 16. | |
|------------|---------------------------|----------------|
| - | Metol (Elon.) | 0.3 gms. |
| | Sodium sulphite (anhyd.) | 40.0 gms. |
| | Hydroquinone | 6.0 gms. |
| | Sodium carbonate (anhyd.) | 19.0 gms. |
| | Potassium bromide | 0.9 gms. |
| | Citric acid | 0.7 gms. |
| | Potassium metabisulphite | 1.5 gms. |
| | Water, up to | 1,000 ccs. |

Suitable for the processing of positive stocks, including that of sound track using the variable area system of recording. It is further stated that slight modifications are called for with different types of continuous plant.

Perutz.

The following stocks are available, all characterised by an extremely fineness of grain. No developer formulæ are given with the exception of those proprietary numbers below—it is stated that these films will give excellent results with normal ciné processing. Stock

Type.

Special Characteristics.

| No. | Type. | Special Characteristics. |
|-----|--|--|
| 701 | Perorto negative. | Normal speed negative with orthochromatic qualities. |
| 702 | Neo-Persenso negative. | High speed orthochromatic. |
| 703 | Special Non-halation Aviation negative. | Normal speed orthochromatic with reduced sensitivity to blue, contrasty in quality suitable for aerial work as its name imples. |
| 704 | Peromnia negative. | High speed panchromatic type, antihalation backing, with rectepanchromatic sensitisation. |
| 705 | Rectepan negative. | Normal speed panchromatic type. Double coated and anti-halation. |
| 712 | Rectepan sub-standard 16 mm. | Suitable for either negative— positive or reversal processes. Normal speed panchromatic. |
| 713 | Rectepan sub-standard 9.5 mm. | As above, for 16 mm. gauge. Both on safety base. |

Developers recommended. Perinal Nos. 94 and 194. Compensating types. Nos. 40 and 140.



EXPOSURE.

The following table, based on that originally compiled by W. K. Burton, gives a general idea of the exposures for various subjects. They are correct for the best lighting, mid-day sunshine in spring or summer, and modern rapid plates or films, about 700 H. & D., or 24 or 25 Schiener.

In weather other than bright sunshine the exposures should be multiplied by:—

Bright diffused light 2
Dull, moderately heavy clouds ... 3
Very dull, dark clouds ... 4 to 5

A preferable method is to test the light by means of a meter of the actinometer type.

TABLE 1.

| F/ No. | Average Subject with objects in Foreground. Street Scenes. Outdoor Figure Studies. | Landscapes with Light Foreground, Lake, River and Beach Scenes. | Sea Clouds and Sky. | Subjects with Extra Heavy Foreground, e.g., Dark Trees, Doorways, Groups. | Under Trees, Woods, Avenues, Glades, etc. | Portrait in Average Well-lighted Room. |
|-----------------------|--|--|---------------------------|--|---|--|
| f/2 f/2·5 f/3·5 | 1/1000 1/640 1/320 | _ 1/500 | | 1/500 1/320 1/160 | 1/60 1/40 1/20 | 1/30 1/20 1/10 |
| f/4·5 | 1/200 | 1/320 | | 1/100 | 1/12 | 1/6 |
| f/6·3 | 1/100 | 1/160 | | 1/50 | 1/6 | 1/3 |
| f/8 | 1/64 | 1/100 | 1/300 | 1/32 | 1/4 | 1/2- |
| f/11 | 1/32 | 1/50 | 1/200 | 1/16 | 1/2 | 1 |
| f/16 | 1/16 | 1/25 | 1/100 | 1/8 | 1·0 | 2-0 |

Note.—Owing to the great number of films of different speeds the above table can only be a rough indication, and the user should particularly bear in mind that roll-films as now made, while of greater speed, also resist the effect of over-exposure to a much greater extent than those of a few years ago. When in doubt, a longer exposure may therefore be given, and that is a good rule, especially for beginners, among whom there is a tendency to give exposures which are too short.

TABLE II.

Daily Variation in Light for different Latitudes.

At other hours of the day and times of the year the above exposures are multiplied by the numbers in Table II. of daylight variation. The figure 1 in Table II. indicates times for which Table I. suffices by itself. Table II. has been worked out for the Almanac by R. de B. Adamson, B.Sc., of Christchurch, N.Z.

| Lati- | North | Morning. | | | | | | South | | | |
|-------------------|---|--|--|---|---|-----------------------------|-----------------------|------------------|-------------|------|---|
| tude. Hemisphere. | | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | Hemisphere. |
| 60° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 1 1 1 1 1 1 2 3 4 6 | 1 1 1 1 1 1 3 6 8 | 1 1½ 1½ 2 2 3 8 | 11 13 13 2 6 | 11/2 11/2 2 3 — | 2 2 3 6 — | 3 3 6 — | 6 | 8 10 | December, Jan., Nov. Feb., Oct. Mar., Sept. April, Aug. May, July June. |
| 55° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 1 1 1 1 2 2 3 4 | 1 1 1 1 1 1 2 2 3 4 | 1 1 1 1 1 1 1 2 3 4 6 | 1 11 11 2 2 4 8 | 1 1 1 2 2 3 8 — | 2 2 3 6 — | 3 6 — | 4 6 — | | December. Jan., Nov. Feb., Oct. Mar., Sept. April, Aug. May, July June. |
| 50° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 1 1 1 1 1 1 2 3 3 | 1 1 1 1 1 2 3 4 | 1 1 1 1 1 1 2 2 3 6 | 1 1½ 1½ 1½ 3 6 | 111 2 3 6 — | 2 2 3 6 | 3 3 6 — | 6 8 | | December Jan., Nov. Feb., Oct Mar., Sept. April, Aug. May, July. June. |
| 40° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 1 1 1 1 1 2 | 1 1 1 1 1 2 2 | 1 1 1 1 1 1 1 2 2 | 1 1 1 1 1 2 2 3 4 | 1 1 1 1 2 4 6 8 | 2 2 3 4 | 3 4 6 — | | | December, Jan., Nov. Feb., Oct. Mar., Sept. April, Aug. May, July June. |
| | | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Day File |
| | | | 70 | | AFI | ERNO | on. | 100 | | | |

TABLE 11. (continued.)

| Lati- | North | Morning. | | | | | | | South | | |
|-------|---|-----------------------|--|--|---|---|----------------------------|------------------|---|---|---|
| | Hemisphere. | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | Hemisphere |
| 30° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 343484 1 1 1242 | 1 1 1 1 1 1 1 1 1 2 | 1 1 1 1 1 1 1 1 1 1 1 2 1 1 2 1 | 1 1 1 1 1 1 1 1 2 2 | 1 1 1 1 1 2 2 2 3 4 4 | 2 2 3 4 6 | 4 6 8 — | | | December. Jan., Nov. Feb., Oct. Mar., Sept. April, Aug. May, July. June. |
| 15° | June May, July April, Aug. Mar., Sept. Feb., Oct. Jan., Nov. December | 1 1 1 | 1 1 | 1 1 1 1 1 1 1 1 2 | 1 1 1 1 1 1 1 1 1 1 1 1 1 | 1½ 1½ 1½ 1½ 1½ 2 2 3 | 3 3 3 4 6 6 | 8 | | | December. Jan., Nov. Feb., Oct. Mar., Sept. April, Aug. May, July June. |
| 0° | May, June, July, Nov., Dec., Jan. Other months | J | 1 3 | 1 | 1 <u>1</u> | 2 1½ | 4 | _ | _ | _ | May, June July, Nov. Dec., Jan. Other months |
| _ | | 12 | 1 | 2 | 3 | 4 | 5 | , 6 | 7 | 8 | |
| | | - | | | AF | TERNO | ON. | · · | *************************************** | | 200 |

All the above factors are for atmospheric conditions as on a clear day in England. Extreme N. of Scotland, Lat. 60°; S. of Scotland, N. of England, N. of Ireland, Lat. 55°; S. of England, S. of Ireland, Lat. 50°.

Shutter Speeds for Moving Objects.

From the "Wellcome Exposure Calculator and Diary."

The following table on the next page gives in round figures the shutter speeds necessary for various moving objects, using the ordinary quarter-plate lens of about 5 inches focus. Column D is for objects moving towards or away from the operator, O is for objects moving obliquely towards or from the camera, that marked A, for objects moving directly across the field of view.

The table indicates the shutter speeds necessary to secure negatives sufficiently sharp for direct printing. For enlarging it is better to give ½ to ½ these exposures, or to work further from the object. The figures are no guide to what is the correct exposure for the plate.

Except where stated, objects are supposed to be 25 ft. from camera. If 50 ft. from camera, exposure may be double that at 25 ft.; if 100 ft., exposure may be double that at 50 ft.

| Distance of Object, 25 ft., unless otherwise stated. | D | 10 | A |
|---|----------------|-------------------------|-------------------------|
| Pedestrians (four miles per hour) Vehicles (six miles per hour) Vehicles (eight miles per hour) | 1/40 | 1/80 | 1/120 |
| | 1/60 | 1/120 | 1/180 |
| | 1/80 | 1/150 | 1/250 |
| Cyclists and trotting horses Poot races and sports Divers | 1/160 1/240 | 1/300 1/500 1/600 | 1/500 1/700 1/800 |
| Cycle races, horse galloping | 1/300 | 1/750 | 1/900 |
| Yachts (10 knots) at 50 ft | 1/60 | 1/120 | 1/180 |
| Steamers (20 knots) at 50 ft | 1/120 | 1/240 | 1/360 |
| Trains (30 miles per hour) at 50 ft | 1/150 | 1/300 | 1/450 |
| Trains (60 miles per hour) at 50 ft | 1/300 | 1/600 | 1/900 |

WEIGHTS AND MEASURES.

Inches and Millimetres.

INCHES INTO MILLIMETRES.

MILLIMETRES INTO INCHES.

| Inches. | Milli- metres. | Inches. | Milli- metres. | Milli- metres. | Inches. | Milli- metres. | Inches. |
|--------------------|----------------------|---------------------------|-------------------|-------------------|----------------------|-------------------|----------------------|
| 1 18 10 | 25·4 23·8 23·0 | 38 11 32 5 16 | 9·5 8·7 7·9 | 1 2 3 | 0·04 0·08 0·12 | 15 16 17 | 0·59 0·63 0·67 |
| 7 18 18 2 | 22·2 20·6 19·1 | 9 32 4 7 32 | 7·1 6·4 5·6 | 4 5 6 | 0·16 0·20 0·24 | 18 19 20 | 0·71 0·75 0·79 |
| 18 8 18 | 17·5 15·9 14·3 | 36 16 38 32 | 4·8 3·2 2·4 | 7 8 9 | 0·28 0·31 0·35 | 21 22 23 | 0·83 0·87 0·90 |
| 基 | 12·7 11·1 | 35 54 | 1.6 0.8 | 10 11 12 | 0·39 0·43 0·47 | 24 25 25 4 | 0·94 0·98 1·0 |

English Sizes of Plates.

| Inches. | Cm. | Inches. | Cm. | |
|--|---|---|---|--|
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $\begin{array}{ c c c c }\hline 17.8 & \times & 12.7 \\ 21.5 & \times & 16.5 \\ 25.4 & \times & 20.3 \\ 30.4 & \times & 25.4 \\ 38.1 & \times & 30.4 \\ \hline \end{array}$ | |

Continental Sizes of Plates (or Roll-film or Film-pack).

| Cm. | Inches. | Cm. | Inches. |
|--|---|--|--|
| $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $\begin{array}{c} 1_{\frac{1}{8}} \times 1_{\frac{1}{2}} \\ 1_{\frac{1}{4}} \times 2_{\frac{3}{8}} \\ 2_{\frac{3}{8}} \times 3_{\frac{1}{2}} \\ 3_{\frac{1}{2}} \times 4_{\frac{3}{4}} \end{array}$ | 10 × 15 12 × 16 13 × 18 18 × 24 | $\begin{array}{c} 3.92 \times 5.9 \\ 4.72 \times 6.30 \\ 5.12 \times 7.08 \\ 7.08 \times 9.44 \end{array}$ |

Sizes of Lantern Slides (Various Countries).

The standard size of English lantern slides is $3\frac{1}{4} \times 3\frac{1}{4}$ inches. The standard French size for lantern slides is 85×100 mm. (the longer side horizontal). The American size is 4 (base) \times $3\frac{1}{4}$ (height) inches, though some makers use $4\frac{1}{4} \times 3\frac{1}{4}$ inches.

British Weights and Measures.

The formulæ in the editorial pages of this Almanac are given, in almost all cases, in both British and metric measures, and in adopting this course we have had the desire to impress upon photographers the simplicity and facility of the latter system. As a rule, the British formulæ are expressed in grains or ounces per 10 ozs. of solution, and the metric formulæ in grammes per 1000 c.c.s. In regard to the total bulk of solution, our formulæ are mostly drawn up on the basis that the total bulk after the solution of the solids is that stated in the formula—10 ozs. or 1000 c.c.s. as a rule.

Percentage Solutions.

To make a 10 per cent, solution I ounce avoirdupois—437½ grains is dissolved in sufficient water to make 4375 minims, 9 ounces I drachm approximately. The object is to make the solution in such a form that every 10 minims will contain I grain of the solid. A corresponding metric solution is 10 grammes dissolved in 100 c.c.s.

Formulæ Stated in Parts.

Formulæ given, as many are, in "parts," may be made up by writing gms. for the solid and c.c.s. for the fluid "parts," and converting them into the British measures by any of the tables in this section. Thus: Pyro, 10 parts; sodium sulphite, 100 parts; water, 1000 parts, becomes Pyro, 154 grs.; sodium sulphite, 3 ozs. 230 grs.; water, 35 ozs.

1. APOTHECARIES WEIGHT.

20 Grains = 1 Scruple.

3 Scruples = 1 Drachm = 60 Grains. 8 Drachms = 1 Ounce = 480 Grains.

It is now customary in formulæ to employ the avoirdupois ounce $(437\frac{1}{2}$ grains), but where "drachms" are given the apothecaries drachm of 60 grains is meant.

2. AVOIRDUPOIS WEIGHT.

4374 Grains = 1 Ounce.

16 Ounces = 1 Pound = 7,000 Grains.

 $\frac{1}{4}$ ounce = 109 grains; $\frac{1}{2}$ ounce = 219 grains; $\frac{3}{4}$ ounce = 328 grains.

3. FLUID MEASURE.

60 Minims = 1 Drachm.

8 Drachms = 1 Ounce = 480 Minims.

 20 Ounces
 = 1 Pint
 = 160 Drachms
 = 9,600 Minims

 2 Pints
 = 1 Quart
 = 40 Ounces
 = 320 Drachms

 4 Quarts
 = 1 Gallon
 = 160 Ounces
 = 1,280 Drachms

1 fluid ounce of water weighs 437½ grains, therefore every minim weighs 0.91 grain.

In the United States the pint is 16 ozs., the quart 32 ozs.

Metric Weights and Measures.

The unit of weight is the gramme, written "gm."; the subdivisions are the "deci-" (1/10th), "centi-" (1/100th), and "milligramme" (1/1,000th); the multiples are the "deka-" (10 gm.), and "hectogramme" (100 gm.), but in practice it is usual to write these quantities as: $0\cdot 1$ or $0\cdot 01$ and 10 or 100 grammes, and the abbreviation "kilo." for 1,000 gms.

The following are the equivalents of Metric Weights and Measures in terms of Imperial Weights and Measures:—

LINEAR MEASURE.

| 1 Millimetre (mm.) (1/1,000th M.) = | 0.03937 inch. |
|-------------------------------------|-------------------|
| 1 Centimetre (1/100th M.) = | 0.3937 inch. |
| | 39.370113 inches. |
| 1 Metre (M.) == | 3 · 280843 feet. |
| | 1.0936143 yard. |
| Kilometre (1,000 M.) = | ·62137 mile. |

SOUARE MEASURE.

| 1 Square Centimetre 1 Square Metre (100 squ decimetres) | are } | $= \frac{.155 \text{ sqr}}{10.7639}$ $= \begin{cases} 10.7639 \text{ sq} \\ 1.196 \text{ sq} \end{cases}$ | uare inch. square feet. quare yards. |
|---|---------|---|--|
| | Weight. | Avoir | dupois. |
| 1 Milligramme (1/1,000t 1 Gramme (1 gm.) 1 Kilogramme (1,000 gm | | $ = 0.015 \text{ g} $ $ = 15.432 \text{ gr} $ $ = \begin{cases} 2.204622 \\ 35.273957 \end{cases} $ | ain |

FLUID MEASURE

1 Cubic centimetre (c.c.) $(1\cdot1,000\text{th litre})=16\cdot9$ minims. 1 Litre (1 L.) = 35 ozs. 94 m. = 16894 · 1 minims. 20 standard drops 1 c.c. (at 15° C.) (Standard drops are 3 mm. in diameter).

Grammes per Litre to Grains per 10 Ounces.

The following table gives the most convenient means of translating metric formulæ into British measures.

| Grammes | Grains | Grammes | Grains | Grammes | Grains |
|---|--|---|---|---------|---|
| per | per | per | per | per | per |
| Litre | 10 Ounces | Litre | 10 Ounces | Litre | 10 Ounces |
| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 | 4·4 8·8 13·1 17·5 21·9 26·2 30·6 35·0 39·4 43·8 48·1 52·5 56·9 61·2 65·6 70·0 74·4 78·8 83·1 87·5 91·9 96·2 100·6 105·0 | 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 | 109·4 \$ oz. 131 153 175 197 219 2 oz. 241 262 284 306 328 306 328 4 oz. 350 371 393 415 437 1 oz. 459 481 503 525 | 125 | 547 1½ oz. 569 591 613 634 656 1½ oz. 700 744 766 1½ oz. 788 831 875 2 oz. 919 962 984 2½ oz. 1006 1050 1094 2½ oz. |

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Grammes Into Grains and Ounces (Avoirdupois).

| Gms. | Ozs. Grs. | Gms. | Ozs, Grs. | Gms. | Ozs. | Grs. |
|--------------------------|--------------------------------|----------------------|--|--------------------------|--|----------------------|
| 0·1 | 1·5 | 16 | $\begin{array}{cccc} \frac{1}{2} & 28 \cdot 1 \\ \frac{1}{2} & 43 \cdot 5 \\ \frac{1}{2} & 59 \cdot 0 \\ \frac{1}{2} & 74 \cdot 4 \end{array}$ | 130 | 4½ | 37 |
| 0·2 | 3·1 | 17 | | 140 | 4¾ | 82 |
| 0·3 | 4·6 | 18 | | 150 | 5¼ | 18 |
| 0·4 | 6·2 | 19 | | 160 | 5½ | 61 |
| 0·5 0·6 0·7 0·8 | 7·7 9·2 10·8 12·4 | 20 25 30 35 | $\begin{array}{cccc} \frac{1}{2} & 89.8 \\ \frac{3}{4} & 57.0 \\ 1 & 25 \\ 1 & 103 \end{array}$ | 170 175 180 190 | 6 6 6 6 1 6 | 0 76 44 88 |
| 0·9 | 13·9 | 40 | 1½ 71 | 200 | 7 | 24 |
| 1· | 15·4 | 45 | 1½ 38 | 250 | 83 | 32 |
| 2 | 30·9 | 50 | 1¾ 6 | 300 | 10½ | 31 |
| 3 | 46·3 | 55 | 1¾ 83 | 350 | 12¼ | 41 |
| 4 | 61·7 | 60 | $\begin{array}{ccc} 2 & 51 \\ 2\frac{1}{4} & 19 \\ 2\frac{1}{4} & 94 \\ 2\frac{1}{2} & 64 \end{array}$ | 400 | 14 | 50 |
| 5 | 77·2 | 65 | | 450 | 153 | 52 |
| 6 | 92·6 | 70 | | 500 | 17½ | 61 |
| 7 | 108·0 | 75 | | 550 | 19¼ | 66 |
| 8 9 10 11 | 14·1 29·5 44·9 1 60·4 | 80 85 90 95 | $\begin{array}{ccc} 2\frac{3}{4} & 32 \\ 3 & 0 \\ 3 & 76 \\ 3\frac{1}{4} & 44 \end{array}$ | 600 650 700 750 | $\begin{array}{c} 21 \\ 22\frac{3}{4} \\ 24\frac{1}{2} \\ 26\frac{1}{4} \end{array}$ | 70 72 81 90 |
| 12 | 1 75·8 | 100 | $ \begin{array}{cccccccccccccccccccccccccccccccccccc$ | 800 | 28 | 95 |
| 13 | 1 91·2 | 110 | | 850 | 29 ³ / ₂ | 102 |
| 14 | 1 106·7 | 120 | | 900 | 31 ¹ / ₂ | 106 |
| 15 | 1 12·7 | 125 | | 1,000 | 35 ¹ / ₄ | 11 |

Number of Grains in Ozs. (Avoirdupois).

In making calculations the following equivalents of ounces and quarter-ounces in grains will be found useful, fractions of grains are omitted.

| $\frac{1}{2}$ oz. = 109 grs. | $2\frac{1}{4}$ ozs. = 984 grs. | $4\frac{1}{4}$ ozs. = 1,859 grs. |
|--------------------------------------|----------------------------------|----------------------------------|
| $\frac{1}{2}$ oz. = 219 grs. | $2\frac{1}{2}$ ozs. = 1,094 grs. | $4\frac{1}{2}$ ozs. = 1,969 grs. |
| $\frac{2}{4}$ oz. = 328 grs. | $2\frac{3}{4}$ ozs. = 1,203 grs. | $4\frac{3}{4}$ ozs. = 2,078 grs. |
| 1 oz. $= 437 \text{grs}$. | 3 ozs. = 1,312 grs. | $5\frac{1}{4}$ ozs. = 2,296 grs. |
| 11 oz. = 547 grs. | $3\frac{1}{4}$ ozs. = 1,421 grs. | $5\frac{1}{2}$ ozs. = 2,406 grs. |
| $1\frac{1}{2}$ oz. = 656 grs. | $3\frac{1}{2}$ ozs. = 1,531 grs. | 6 ozs. = 2,625 grs. |
| $1\frac{1}{2}$ oz. = 765 grs. | $3\frac{3}{4}$ ozs. = 1,640 grs. | $6\frac{1}{4}$ ozs. = 2,734 grs. |
| $2 \text{ ozs.} = 875 \mathrm{grs.}$ | 4 ozs. = 1,750 grs. | $6\frac{1}{2}$ ozs. = 2,844 grs. |
| #1634 7/2 (54 LE) | | |

Cubic Centimetres to Fluid Ounces and Minims.

| C.c. | Fl. oz. | minims. | C.c. | Fl. ozs. | Minims. |
|---|-------------|--|--|---|---|
| 1 2 3 4 5 6 7 8 9 10 20 | | 16·9 33·8 50·7 67·6 84·5 101 118 138 152 169 338 | 60 70 80 90 100 200 300 400 500 600 | 2 2 2 2 3 3 7 10 14 17 21 | 54 223 391 80 249 19 268 37 287 56 |
| 30 40 50 | 1 1 1 | 27 196 365 | 700 800 900 1,000 (1 litre) | 24 28 31 35 | 305 75 324 94 |

One Gallon (English) of 160 ounces is 4 Litres 546 c.c. (4.546 Litres).

Factors for Conversion of Metric Figures to Grains and Ounces.

C.c.s. to Minims and Ozs.—It is near enough to use the table on page 410, reckoning gms. as c.c.s. and grains as minims. Example, 35 c.c.s. equal 1 oz. (fluid) + 103 minims.

Conversion Rules.—Gms. per litre into grains per oz.—Multiply the grammes by 0.44.

C.c.s. per litre into minims per ounce.—Divide the c.c.s. by 2 (more exactly, multiply by 0.48).

Grains per ounce into grammes per litre.-Multiply the grains by 2.28. Thus 50 grs. per oz. = 114 gms. per litre.

Minims per ounce into c.c.s. per litre.—Multiply the minims by 2.

Conversion of British into Metric Measures. Grains into Grammes.

| Grs. | Gms. | Grs. | Gms. | Grs. | Gms. |
|---|--|--|---|--|--|
| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 | 0·065 0·13 0·194 0·259 0·324 0·389 0·454 0·518 0·583 0·648 0·713 0·775 0·842 0·907 0·972 | 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 | 1·037 1·102 1·166 1·232 1·296 1·361 1·426 1·490 1·555 1·620 1·685 1·750 1·814 1·880 1·944 | 35 40 45 50 55 60 65 70 75 80 85 90 95 | 2·268 2·592 2·916 3·240 3·564 3·888 4·212 4·536 4·860 5·184 5·508 5·832 6·156 6·480 |

Ounces (Avoirdupois) to Grammes.

| Ozs. | Gms. | Ozs. | Gms. | Ozs. | Gms. |
|----------------|-------|------|----------|------|----------|
| 1 | 7.09 | 4 | 113.40 | 13 | 368 · 54 |
| - 1 | 14.17 | 5 | 141.75 | 14 | 396.89 |
| 3 | 21.26 | 6 | 170.10 | 15 | 425 - 24 |
| 1 | 28.35 | 7 | 198 - 45 | 16 | 453 - 59 |
| 11 | 42.5 | 8 | 226.80 | 17 | 481 . 94 |
| 2 | 56.70 | 9 | 255.15 | 18 | 510.29 |
| $2\frac{1}{2}$ | 70.87 | 11 | 311.8 | 19 | 538 - 64 |
| 3 | 85.05 | 12 | 340.19 | 20 | 566.99 |

OPTICAL CALCULATIONS.

Finding the Focal Length of a Lens.

The focal length of a lens may be readily ascertained by the following method. Focus carefully on some very distant object, a sharply defined object outlined against the sky is a good subject. Then measure the camera extension between the back frame and any convenient point on the moving front. Now focus sharply any small flat object—a page of type or a letter answers well—so that the image on the focussing screen is one half or one-fourth of the length of the object focussed. Measure the camera extension again from the back frame to the point previously chosen when

the lens was focussed on the distant object. The distance between the two extensions, *i.e.*, the difference between the two measurements will be one-half or one-fourth of the focus of the lens according to the scale of the near object focussed.

If the extension of the camera is sufficient, the near object should be focussed so that the image on the focusing screen is exactly the same size as the object. The difference between the two extensions of the camera is then the focal length of the lens. This method is theoretically sound, and only requires care to give accurate results.

Notes on Scale of Reproduction, etc.

It is a simple matter to determine the scale of reproduction if the focal length of the lens is known. For example, an object is situated at 72 inches from the lens, and the focal length is 8 inches. Divide 72 by 8, the result is 9. Subtract 1 from 9, the result is 8, which means that the image on the screen will be one-eighth the length of the object. The figure 1 is a constant for all lenses and distances. A second example. A 6-inch lens is fitted to the camera, and it is desired to ascertain the distance from the lens to the object for obtaining an image one-sixth of the size of the object. Add 1, the constant, to the figure 6 representing the desired scale. This gives 7, and 7 times the focal length of the lens—6 inches—is 42 inches which is the distance at which the object must be placed.

Another application of the same rule is, given length of studio the size that a standing figure would be reproduced on the plate, or, how far from the camera the sitter would have to be placed for a large head. For example, if 15 ft. is the greatest distance from the camera to the standing figure—a man 5 ft. 10 ins. high—and the lens is 10 ins. in focal length, the working will be:—15 ft. = 180 ins. divided by 10 ins., the focal length of the lens gives 18. Subtract the constant, I, and the remainder 17, divided into 5 ft. 10 ins. gives approximately $4\frac{1}{8}$, too large for a quarter-plate, for which a lens of about $8\frac{1}{8}$ ins. would be preferable.

The rule is that the scale of reproduction is found by dividing the distance from the lens to the object by the focal length of the lens, and always subtracting 1 from the resulting figure. The camera extension, measured from the optical centre of the lens to the plate, will always be equal to the distance between the lens and the object divided by the scale of reproduction. As an example, as previously stated, an object 72 inches from the camera fitted with an 8-in. lens will be reproduced at a reduction of one-eighth of its size. The distance, 72 ins., divided by the denominator of the fraction 8, gives 9, the extension of the camera, 1 inch beyond the normal focal length, a fraction of the focus equal to the scale of reproduction. This covers the whole principle of copying to scale.

Ascertaining the Focal Length of a Combination.

The rule for finding the focal length of a double lens, when the focus of each component and the separation are known, is very simple. The separation is measured from the optical centre and in the case of a thick single lens this is frequently situated at some distance outside the convex surface. Two lenses may be set quite close together in the mount while their optical centres may be from 1 to 2 ins. apart, and this is their theoretical separation.

If the focal lengths of the two components are multiplied together, and the resulting figure is divided by the figure obtained by adding together the two focal lengths and subtracting the separation, the result is the focal length of the combination.

Take, as an example, two single lenses, one 8 ins. and one 10 ins., with a separation of 2 ins.

$$\frac{8 \times 10}{8 + 10 - 2} = \frac{80}{16} = 5$$
 ins., the focus of the combination.

Magnifiers.

When using a supplementary lens (magnifier) as a means of bringing near objects into focus when employing a camera fitted with a lens adjusted for use at fixed focus, the focal length of the supplementary lens must be equal to the distance of the object. This holds good whatever the focal length of the original lens.

Telephoto Rules.

F = equivalent focal length of complete lens.

 f_1 = equivalent focal length of positive. f_2 = equivalent focal length of negative.

E = camera extension, from negative lens to ground glass.

M = nagnification, that is, number of times the image given by the complete lens is larger than that given by positive alone.

Magnification when working at given extension is found by dividing camera extension by focal length of negative lens and adding 1.

$$M=\frac{E}{f_2}+1.$$

Camera extension, necessary for given nagnification—multiply focal length of negative lens by magnification less 1.

$$E = f_2 (M-1).$$

Focal length of complete lens.—Multiply focal length of positive by magnification.

Comparison of Thermometer Scales.

Equivalence of Centigrade and Fahrenheit degrees.

| Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. | Centigrade. | Fahrenheit. |
|----------------------------------|--------------------------------------|----------------------------|---|---------------------------------|---|
| 0 | 32·0 | 35 | 95·0 | 70 | 158·0 |
| 1 | 33·8 | 36 | 96·8 | 71 | 159·8 |
| 2 | 35·6 | 37 | 98·6 | 72 | 161·6 |
| 3 | 37·4 | 38 | 100·4 | 73 | 163·4 |
| 4 | 39·2 | 39 | 102·2 | 74 | 165·2 |
| 5 | 41·0 | 40 | 104·0 | 75 | 167·0 |
| 6 | 42·8 | 41 | 105·8 | 76 | 168·8 |
| 7 | 44·6 | 42 | 107·6 | 77 | 170·6 |
| 8 | 46·4 | 43 | 109·4 | 78 | 172·4 |
| 9 | 48·2 | 44 | 111·2 | 79 | 174·2 |
| 10 | 50·0 | 45 | 113·0 | 80 | 176·0 |
| 11 | 51·8 | 46 | 114·8 | 81 | 177·8 |
| 12 | 53·6 | 47 | 116·6 | 82 | 179·6 |
| 13 | 55·4 | 48 | 118·4 | 83 | 181·4 |
| 14 | 57·2 | 49 | 120·2 | 84 | 183·2 |
| 15 | 59·0 | 50 | 122·0 | 85 | 185·0 |
| 16 | 60·8 | 51 | 123·8 | 86 | 186·8 |
| 17 | 62·6 | 52 | 125·6 | 87 | 188·6 |
| 18 | 64·4 | 53 | 127·4 | 88 | 190·4 |
| 19 | 66·2 | 54 | 129·2 | 89 | 192·2 |
| 20 | 68·0 | 55 | 131·0 | 90 | 194·0 |
| 21 | 69·8 | 56 | 132·8 | 91 | 195·8 |
| 22 | 71·6 | 57 | 134·6 | 92 | 197·6 |
| 23 | 73·4 | 58 | 136·4 | 93 | 199·4 |
| 24 | 75·2 | 59 | 138·2 | 94 | 201·2 |
| 25 | 77·0 | 60 | 140·0 | 95 | 203·0 |
| 26 | 78·8 | 61 | 141·8 | 96 | 204·8 |
| 27 | 80·6 | 62 | 143·6 | 97 | 206·6 |
| 28 | 82·4 | 63 | 145·4 | 98 | 208·4 |
| 29 | 84·2 | 64 | 147·2 | 99 | 210·2 |
| 30 31 32 33 33 34 | 86·0 87·8 89·6 91·4 93·2 | 65 66 67 68 69 | 149·0 150·8 152·6 154·4 156·2 | 100 105 110 115 120 | 212·0 221·0 230·0 239·0 248·0 |

Tables in Past Almanacs.

The following is a list of tables which have appeared in past issues of the "Almanac," but are not included among those in the present volume.

The reference in brackets after each is to the most recent issue of the "Almanac" in which the table has appeared: in most cases it will be found included for several years prior to the date of this reference.

CHEMICAL.

Simplification of Enulsion Calculations (Equivalence of Alkaline Haloid Salts). (1903, p. 1160.)

Solubility of the Silver Haloids.— Valenta. (1907, p. 1109.)

Freezing Mixtures. (1907, p. 1116.)

Developing Equivalence of the alkalis. (1903, p. 1159.)

Chemical Reactions of the known Developing Agents (Tests of Developers). (1904, p. 1010.)

Pyro Developers recommended for various Plates by Makers. (1890, p. 666.)

Tables of Developers (in grains per oz.) for various Commercial Plates. (1912, p. 761.)

Formulæ of Chemicals. (1924, p. 483.) Solubilities of Chemicals. (1924, p. 489.)

Poisons and Antidotes. (1927, p. 449.)

LIGHT AND EXPOSURE

Variation in the Sun's Position at Different Seasons of the Year,—J. A. C. Branfil. (1903, p. 1176.)

Points of the Compass at which the Sun rises for London, Edinburgh and Dublin. (1869, p. 147.)

Sun's Altitude for various Latitudes. (1898, p. 1063.)

Exposure and Lens Aperture. (1910, p. 893.)

Actinograph Exposure Table. (1901, p. 702.)

Comparative Exposures.—W. K. Burton. (1887, p. 341.)

Comparative Plate-Speed Numbers. (1912, p. 897.).

ORTHOCHROMATIC.

Speeds and Colour Sensitiveness of various Plates to Different Lights.— Eder. (1907, p. 1115.)

Wave-Lengths of the Principal Fraunhofer Spectrum Lines, and the Elements that give them. (1905, p. 1144.)

Reflection of Light from various Surfaces. (1900, p. 1016.)

OPTICAL.

Equations relating to Foci, etc.—Branfil. (1907, p. 1120.)

Combining Lenses.—Formulæ. (1910, p. 893.)

Perspective.-Factors. (1910, p. 895.)

Correction of Convergent Distortion.— Formulæ. (1910, p. 896.)

Scale of Image. (1910, p. 893.)

Conjugate Foci. (1910, p. 892.)

Royal Photographic Society's Standard Diaphragms. (1903, p. 1178; 1905, p. 1149, and 1907, p. 1093.)

Uniform System Numbers for Stops from f/1 to f/100. (1905, p. 1147.)

Continental Stops and their U.S. Equivalents. (1907, p. 1127.)

Correction for Inconstancy of Aperture. (1910, p. 895.)

Angles and Foci of the Telephoto Lens. (1894, p. 949.)

Steinheil's Tables of Camera Extensions, etc., corresponding to a given Magnification of the Telephoto Lens. (1902, p. 732.)

Focussing with Pinhole Apertures. (1896, p. 954.)

Aperture Markings of Old Lenses (1927, p. 457.)

View Angles. (1927, p. 458-459.)

Diaphragm Numbers.

Diaphragm apertures are always expressed in fractions of the focal length of the lens; thus F/8 indicates that the aperture so marked is one-eighth of the focus. With apertures of F/8 and smaller they are so arranged that each smaller size requires twice the exposure of the next size larger. In the ultra-rapid lenses, particularly those made specially for miniature cameras, this principle has had to be modified in regard to the full aperture.

In the following table the upper line gives the F numbers of the principal diaphragm apertures, and the lower line the relative exposures, taking F/8 as the unit for convenience, only.

| F | 2 | 3 | 3.5 | 4.5 | 6.3 | 8 | 11.3 | 16 | 22.6 | 32 | 45 |
|--------------|----|---|-----|-----|-----|---|------|----|------|----|------|
| Rel. Exp. | 16 | 1 | 15 | 13 | 58 | 1 | 2 | 4 | 8 | 16 | 32 · |

Most continental lenses are marked with a slightly different series, though each aperture, from $F/6\cdot 3$ downwards requires twice the exposure of the next larger size. The apertures in this series are— $F/4\cdot 5:6\cdot 3:9:12\cdot 5:18:25$.

Many lenses on Kodak cameras are marked with the U.S. or Uniform System. In the following table the upper line shows the F numbers and the lower line the Uniform System numbers.

| F | 8 | 11.3 | 16 | 22.6 | 32 | 45 |
|------------|---|------|----|------|------|----|
| U.S. No | 4 | 8 | 16 | 32 | 64 1 | 28 |

Depth of Focus Tables.

Formula for Finding the Hyperfocal Distance.

The following simple formula is the usual method of calculating the hyperfocal distance. While the formula on the preceding page gives a different circle of confusion for each size of plate, so that when enlarged to the same size of picture the departure from critical sharpness shall be uniform irrespective of the size of plate used, this formula gives a disc of confusion that is a fraction of the focal length of the lens with which the picture was taken, generally one-thousandth. This, in enlarging to a given size, produces different degrees of departure from sharp definition according to the lens used in taking the negative. The formula allows for any size circle of confusion being selected for making the calculation—a very useful feature when a considerable degree of enlargement is intended.

In these examples 1/1,000th of the focal length is selected for convenience in illustrating the working.

$$H = Hyperfocal distance in inches.$$

$$F =$$
Focal length of lens.

$$D = Diameter of disc of confusion.$$

$$S = Stop value.$$

If
$$D = \frac{1}{1,000} F$$
 in the original negative.

$$\frac{1,000 \times F}{S}$$
Example: A A in lens used at $f/5.6$

Example: A 4-in, lens used at
$$f/5 \cdot 6$$
.

$$\frac{1,000 \times 4}{5 \cdot 6} = 714 \text{ ins.} = 59: 6 \text{ ins.}$$

Hyperfocal Distances.

Amplified from a Table by R. de B. Adamson, B.Sc.

The following table is for the simple and accurate calculation of hyperfocal distances. These distances are calculated for a disc of confusion of such a diameter that if the image is enlarged up to 8 × 6 ins. the disc of confusion will be one-thousandth of the diagonal, 10 ins., or one-hundredth of an inch. This, it will be evident, gives a different circle of confusion for each size of plate as well as variation of the focal length of the lens.

The hyperfocal distance corresponding with any focal length and lens aperture is found by dividing the figure given in the table for the size of plate in use, by the f number.

| Focal Length | | | | Size of P | late, in ir | nches. | | | |
|---|---|---|---|--|---|---|---|---|--|
| of Lens in | 36×24 mm. | 2 to ×13 | 21×21 | 31×21 | 3½×2½ | 41×31 | 41×31 | 4 ½ × 2 ½ | P.C.& 5×4 |
| inches. | | Hyperfoc | al Distan | ces in fe | et multip | lied by t | he F/no | . used. | |
| 2 22 24 24 25 3 3 4 4 4 5 6 6 7 7 8 9 10 | 196 248 307 372 441 517 692 784 992 1225 1484 1764 2066 2407 3138 3969 4914 5922 7056 | 115 145 180 217 259 304 464 460 582 718 869 1040 1220 1410 1840 2330 2870 3480 4140 | 105 132 164 198 236 277 3268 420 530 655 793 944 1110 1280 1680 2120 2620 3170 | 84 107 132 160 190 223 258 337 427 638 760 892 1030 1350 1710 2110 250 3040 | 77 98 121 146 174 205 238 273 310 392 484 586 696 820 952 1240 1570 1940 2340 2780 | 68 86 106 128 152 178 207 238 271 343 423 511 608 712 828 1080 1370 1690 2040 2430 | 62 79 97 118 140 164 191 219 249 315 389 471 560 656 764 996 1260 1560 1580 2240 | 59 75 92 112 133 155 180 207 236 368 446 532 620 720 1470 1780 2130 | 52 66 81 98 117 137 159 183 208 264 468 548 636 832 1060 1380 1380 |

For example, it is desired to find the hyperfocal distance for a 4-in. lens used in making a $3\frac{1}{4} \times 2\frac{1}{4}$ negative. The figure in the table is 337 opposite 4, the focal length, in the column giving the size of the plate. If the aperture is $f/4 \cdot 5$, 337 is divided by $4 \cdot 5$ which gives 75, the hyperfocal distance in feet. At $f/5 \cdot 6$ the calculation is 337 divided by $5 \cdot 6$, and the result is 60 ft.

Focussing scales constructed on this plan for the hyperfocal distance with the lens at full aperture would be an enormous improvement. With the lens stopped down to an F/No, twice that of full aperture the limits of definition would be the second numbers above and below; to an F/No, four times that of full aperture, the fourth numbers above and below; and to an F/No, eight times that of full aperture, the eighth numbers above and below.

Lenses for Studios.

FOCAL LENGTHS OF LENSES FOR STUDIOS OF VARIOUS LENGTHS.

The following table shows the focus of lens which is suitable for comfortable working in studios of various lengths. In each case it is assumed that 5 ft. of the length will be taken up by camera, operator, sitter and background. The figures in column 1 are the full run of the studio, including this 5 ft. In the case of the short studios the focal lengths are about the longest which can be used; in the case of the longer studios somewhat greater focal lengths might be used, but the lenses directed in the table are about the best for general work.

| Length of Studio. Feet. | C.D.V. full length. Inches. | C.D.V. half length and Cabinet full length. Inches. | C.D.V. head, Cabinet half length. Inches. | Cabinet head and 8×6 full length. Inches. | 8×6 half length, 12×8 full length. Inches. | 8×6 head, 12×8 half length. Inches |
|----------------------------------|--------------------------------------|---|--|--|--|---|
| 12 14 | 4* 43* | 6½* 7½* 8½ | 8 1 9 | 9* 10* | 12* 13* | 14 16 |
| 16 | 43* 53 | 81/2 | 10 | 101 | 16 | 18 |
| 18 | 6 | 9 | 101 | 101 | 16 | 18 |
| 20 | 6 | 10 | 11 | 12 | 18 | 20 |
| 22 | 7 | 101 | 12 | 14 | 20 | 22 |
| 24 | . 8 9 . | 12 | 14 | 16 | 22 | 24 |
| 24 28 30 | 9 . | 13 | 16 | 17 | 24 24 | 22 24 24 24 |
| 30 | 10 | 131 | 16 | 18 | 24 | 24 |

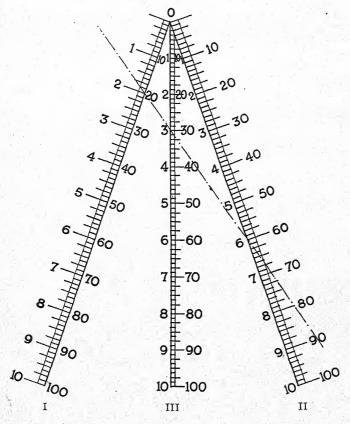
^{*} Full lengths may be obtained with these focal lengths, but the standpoint is so near to the sitter that good perspective cannot be expected.

Depth Table for Amateur Cine Cameras.

CALCULATED FOR A LENS OF 1 INCH (25 mm.) FOCUS AND A DISC OF CONFUSION OF 0.001 INCH.

| inf. $23 - \inf$ 19 - \inf 17 - \inf 13 - \inf 9 - \inf 7 - \inf 18 - \inf 19 - \inf 17 - \inf 11 - \inf 9 - \inf 7 - \inf 18 - \inf 16 - \inf 17 - \inf 11 - \inf 17 - \inf 17 - \inf 18 - \inf 18 - \inf 17 - \inf 18 - \inf 17 - \inf 18 - \inf 17 - \inf 18 - \inf 18 - \inf 18 - \inf 19 - \inf 19 - \inf 10 - \inf 10 - \inf 10 - \inf 10 - \inf 11 - \inf 12 - \inf 13 - \inf 14 - \inf 15 - \inf 16 - \inf 17 - \inf 18 - \inf 19 - \inf 19 - \inf 19 - \inf 10 10 - \inf 10 10 - \inf 10 1 |
|---|
|---|

ABACUS FOR OPTIMUM FOCUSSING DISTANCE.



Here, scale I represents the distance of the nearest object to the camera which must be in correct focus, and scale II, the distance from the camera of the farthest object to be in focus.

By joining together the two points on scales I and II, the best distance on which to focus the lens will be found on the central scale III. The distances may be measured in inches, feet or yards, so long as the same unit is used throughout, and if the left hand figures on one scale is used, the left hand figures of the others must also be used, otherwise the result will be incorrect.

Distances for Cine Projection.

The figures in the vertical columns denote the distances (in ft.) required for projection of pictures of the widths given at the head of each column when using lenses of the focal lengths given in the column on the left-hand side.

For 9.5 mm. Films.

| Focal | · v | Width of Motion-Picture required (ft.) | | | | | | |
|---------|--------|--|-----|----|----|----|-----|--|
| length. | 1 | 2 | 3 | 4 | 6 | 8 | 10 | |
| 2 cm | . 21 | 5 | 71 | 10 | 15 | 20 | 25 | |
| 1-in | . 3 | 6 | 9 | 12 | 18 | 24 | 30 | |
| 1½-in, | . 41/2 | 9 | 131 | 18 | 27 | 36 | 45 | |
| 2-in | . 6 | 12 | 18 | 24 | 36 | 48 | 60 | |
| 3-in | . 9 | 18 | 27 | 36 | 54 | 72 | 90- | |
| 4-in | . 12 | 24 | 36 | 48 | 72 | 96 | 120 | |

Example:—For 3 ft. picture with 1-in. lens, distance of screen from projector requires to be 9 ft.

For 16 mm. Films.

| Focal length. | | Wi | dth of | Motion | -Picture | requi | red (ft. |) |
|------------------|------|-----|--------|--------|----------|-------|----------|-----|
| rengen. | 1 | 2 | 3 | 4 | 6 | 8 | 15 | 20 |
| 2 cm. | 2 | 33 | 53 | 72 | 111 | 13½ | 29 | 40 |
| 1-in, | 21/2 | 5 | 73 | 91 | 141 | 191 | 36½ | 49 |
| 1½-in. | 35 | 7₺ | 11 | 141 | 22 | 29 | 54 | 72 |
| 2-in. | 5 | 94 | 141 | 19 | 29 | 39 | 73 | 97 |
| 3-in. | 7≵ | 141 | 22 | 29 | 43½ | 58 | 109 | 145 |
| 4-in. | 91 | 19 | 29 | 39 | 58 . | 77 | 145 | 193 |

CHEMICALS.

Properties of Chief Chemicals Used in Photography.

On these pages are given particulars of just those chemicals which are used in everyday photography, with those of a few others not so regularly employed. The facts here collected are those which it is useful to know for the proper making-up of solutions: and they also enable photographers unacquainted with chemistry to identify chemicals by their different names.

Acetic Acid (CH₂COOH).—Sold "glacial," which is the strength to be used in formulæ unless otherwise directed. The glacial acid is a liquid of sp. gr. 1.055, which strongly blisters the skin. At 50 deg. F. it solidifies to a mass of crystals. Thus in cold weather it may be necessary to melt the contents of a bottle of the acid before use by standing the bottle in warm water. absorbs water Glacial acid strongly from the air and must be kept well stoppered. mixes in all proportions with water, alcohol, ether, chloroform and glycerine, and dissolves gelatine, celluloid, fat, oils, etc. In United States a No. 8 acid of 1.040 sp. gr. is commonly prescribed in formulæ, it is of 31 per cent. strength, i.e. about one-third the strength of the glacial acid.

Albumen.—One of the protein colloid substances which largely compose living tissue, animal and vegetable. Contains nitrogen, sulphur, oxygen, carbon and hydrogen. The typical albumen occurs in white of egg, which is the only animal albumen having any photographic use. Egg albumen is soluble in water and dilute solutions of alkalies and salts. Heated to

about 163°F. it is irreversibly coagulated, becoming then amorphous and insoluble. The same effect is produced by strong alcohol, and by most metallic The solution of eggalbumen is extremely liable to decompose and, if not used at once, requires to be preserved with an antiseptic. Invert albumen, which is soluble in alcohol, is prepared from egg albumen by treating first with acid and then alkali. Its use is now limited to process work, owing to the disuse of albumenised paper and of the albumen processes.

Alcohol.-Ordinary alcohol is ethyl alcohol (C2H5OH) which, when of sp. gr. 0.794, is "absolute alcohol" (=100 per cent.). Alcohol containing 10 per cent. water is "rectified spirit." Methylated spirit consists of rectified spirit plus 10 per cent. crude wood spirit (to render it undrinkable) and oneeighth per cent. mineral naphtha. The naphtha appears as a milkiness when the spirit is mixed with water. Methylated spirit which has taken up water, e.g., from wet negatives or prints, can be largely dried by shaking with dry potassium carbonate. The latter takes up the water which forms a dense solution of it. The partially dried spirit, which takes up about 0·1 per cent. of the potass. carbonate, can afterwards be poured off.

Alum.—Double sulphate of aluminium and potassium (or ammonium), i.e. potash alum or ammonia alum [Al₂ (SO₄)³ K₂ Al_2 $(SO_4)_3$ SO, 24H,O or (NH₄)₂ SO₄ 24HO₂]. Potash alum is made in large white crystals, but is more conveniently dissolved if bought in powder One part will dissolve in ten parts of cold water; in very much less hot water, which therefore should be used when making stock solution. Ammonia alum is not quite so soluble. Both alums dissolve in glycerine. Both are acid substances, decomposing hypo, with deposition of sulphur. Alum for photographic use should be free from iron, the presence of traces of which is liable to give rise to bluish stains in sulphide-toned prints which have been hardened in a bath containing impure

Amidol, i.e., diamidophenol hydrochloride of C₆ H₃ OH (NH₂)₂. Fine white or bluish grey crystals, very soluble in water, but almost insoluble in alcohol. The solution is acid; addition of soda carbonate produces effervescence. Amidol in the dry state is slowly affected by air and light and should be kept in well stoppered yellow bottles. When preparing a solution for development, the amidol must be dissolved in a solution of sodium sulphite. It keeps only a short time and should be used on the day that it is made or the following day.

Ammonia, i.e., liquor ammonia, strong solution in

water of the gas NH₃. Ammonia is sold as of sp. gr. 0·880, *i.e.*, strongest liquor ammonia, but is often of somewhat less strength. The strong solution rapidly loses strength by exposure to the air. When purchasing a few ounces, it is well to mix with an equal bulk of water, using a double quantity of this half strength mixture in making up any formulæ.

Ammonium bichromate (NH₄), Cr₂O₇.—Orange crystals, formed by neutralising chromic acid with ammonia. More soluble than the potash salt, one part dissolving in four parts of cold water; far more soluble in warm water, and fairly soluble in absolute alcohol. It can replace potass. bichromate in the sensitising of gelatine in the carbon, carbro, and oil processes, and is frequently used in preference on account of its stronger action. It is also largely used for sensitising in photo-mechanical process work, especially in the half-tone processes.

Ammonium bromide, i.e., bromide of ammonia, NH₄Br. White crystalline powder dissolving in 1½ times its weight of cold water; slightly soluble in alcohol. It becomes moist by exposure to the air and should be kept well stoppered.

Ammonium carbonate, i.e., ammonia, rock ammonia. A mixture of ammonium bicarbonate and ammonium carbamate, sold in hard opaque pieces, smelling strongly of ammonia. Any white powdery crust on the pieces should be scraped off before using. Dissolves in about four times its weight of cold water; should not be dissolved in hot water.

Ammonium chloride, NH_4Cl . A commercial quality is the sal ammoniac sold for batteries. One part dissolves in three parts of cold water; in $1\frac{1}{2}$ parts hot water.

Ammonium persulphate, $(NH_4)_2S_2O_8$. Small white crystals, dissolving in $1\frac{1}{2}$ times their weight of cold water. Decomposed by hot water. Persulphate greedily absorbs moisture from the air and must be kept in a well stoppered bottle.

Ammonium sulphide.—Sold as deep yellow liquid smelling strongly of rotten eggs. Contains traces of other sulpho compounds with the ammonium sulphide $(NH_4)_2S$.

Ammonium sulphocyanide. ammonium thiocyanate, i.e., sometimes called ammonium sulphocyanate, NH, CNS. Small white crystals which absorb moisture with great avidity, becoming wet if not well stoppered. Sulphocyanide, which has deteriorated in this manner should be thrown away; it cannot be dried by heat. The chystals are exceedingly soluble in water and in alcohol.

Borax, i.e., borate of soda, Na₂B₄O₇ · 10H₂ O. Pure white crystalline powder, one part of which dissolves in 12½ parts of cold water—but very much more readily in hot water. Solutions of borax in water are slightly alkaline.

Calcium chloride, CaCl₂.— The commercial fused form of this substance is the most active absorbent of moisture, for which purpose, in admixture with asbestos, it is used for preserving platinotype paper in a dry condition. An ample supply of the dried chloride can be used with advantage in containers (preferably metal boxes) of sensitive papers or plates. The lumps of chloride may be put in a holder of perforated zinc, of size sufficient for several pounds. When it becomes visibly damp, the chloride can be restored to its original condition by heating it in an iron shovel over the fire.

Caustic potash, i.e., potass hydrate, potass hydroxide, KOH. The "strongest" form of alkali, having a powerful corrosive action on the skin. The pure photographic quality is sold in sticks which quickly become moist to the touch by absorbing water from the air and also in time become encrusted with a powdery deposit due to the formation of carbonate by absorption of carbon dioxide. Caustic potash must be kept in a well corked bottle, not glass stoppered, since the potash acts on the glass and causes the stopper to stick. For the same reason solution of caustic potash should be rubberstoppered. A purer form of caustic potash is that known as "pure by alcohol"; the potash is in pieces of fibrous Caustic potash disstructure. solves readily in half its weight of cold water with production of much heat. A solution quickly cleans greasy bottles; it softens gelatine a weak hot bath being used for the wholesale removal of the films from waste negatives.

Caustic soda, i.e., sodium hydrate, sodium hydroxide, NaOH. Except that it is a somewhat less "powerful" alkali and is not so readily soluble in water, caustic soda is similar to caustic potash. It is supplied in stick form and,

in two qualities, "pure" and "pure by alcohol," and calls for the same precautions in keeping it in the solid state and in solution.

Chrome alum, double sulphate of chromium and potassium, Cr₂ K₂ (SO₄)₄ 24H₂ O. Violet crystals which are ruby red by transmitted light. Dissolves in about six times its weight of cold water. Hot water should not be used for dissolving it. Chrome alum toughens gelatine somewhat more energetically than do the ordinary white alums, and its tanning action is further increased by addition of ammonia, drops of sufficient to render the solution slightly alkaline.

Chlorquinoel, a white or slightly tinted crystalline powder, which dissolves readily in water and is also soluble in alcohol and other organic solvents. Much more energetic developer than hydroquinone, which it resembles chemically.

Citric acid, small colourless crystals extremely soluble in water; slightly soluble in alcohol.

Copper sulphate, sulphate of copper, blue vitriol, CuSO₄· 5H₂· O. Blue crystals which dissolve in 2½ times their weight of cold water; half their weight of hot water; insoluble in alcohol. For its chief photographic use, namely copper toning, the pure sulphate should be used; commercial sulphate oftens contains iron. Should be kept well corked to prevent formation of a bluish-green incrustation.

Dextrine, fine powder, which for use as a mountant, should be the pure white quality; the yellow is less suitable. Simply dissolved in a little water, dextrine forms a highly adhesive syrup but is best prepared by heating it with about 1½ times its weight of water to 160 deg. F. and setting it aside in a cool place for the mixture to congeal to a firm smooth paste.

Ferric ammonium citrate, double citrate of iron and ammonia. It is obtainable in two forms—(1) brown scales, from any chemist, and (2) fine green scales from photographic dealers. The green citrate is much more sensitive to light than the brown and is now almost always used in the preparation of sensitive iron-printing papers.

Ferrous oxalate, the active substance $Fe(COOH)_2 2H_2O$ of the ferrous oxalate developer. It is itself almost insoluble in water, but is freely soluble in solution of potass. oxalate. It is thus formed in solution by mixing solutions of ferrous sulphate and potass oxalate.

Ferrous sulphate, sulphate of iron, proto-sulphate of iron. green vitriol, FeSO4.7H,O Should be in clear emerald green crystals, free from reddish markings. Slowly oxidises in the air and must be kept well stoppered. One part dissolves in about 11 parts of cold water, forming a green solution which also gradually oxidises, becoming more yellowish in tint and slightly turbid. This change can be prevented by making the solution acid with a little sulphuric or tartaric acid, and by keeping a few pieces of iron wire in the mixture. Also the solutions keep better in bright light.

Formaline, 40 per cent. solu-

tion of formaldehyde, H.COH. The solution has a characteristic penetrating odour, causing the eyes to water. It mixes with water in all proportions and is slightly acid.

Gelatine is not a definite chemical compound, but a mixture of colloid substances. It swells in cold water, dissolves when the swollen mass is heated and sets to a jelly on cooling. A solution of gelatine may be sufficiently weak to be fluid when cold: on addition of alcohol the gelatine is thrown out of solution. Gelatine is dissolved in the cold by oxalic. hydrochloric, acetic and nitric The mixture with the acids. last named forms a liquid glue; that with acetic acid is used as a cement for celluloid. Barium chloride and chloral hydrate also dissolve gelatine in the cold. Alum formaline and tannic acid harden gelatine, i.e., render it insoluble in, and unswollen by, water.

Glycerine, colourless syrupy liquid, C₃ H₅ (OH)₃, of sp. gr. 1.265. It mixes with water or alcohol in all proportions, 100 parts of glycerine dissolve-lead acetate, 20 parts; alum 15 parts; borax, 60 parts; potass. bromide, 25 parts; soda carbonate 98 parts; potass iodide, 40 parts. Glycerine is entirely non-volatile at the ordinary temperature, that is does not "dry up." A solution of it in water is therefore used as a bath for rendering supple the gelatine coating on papers or film after drying; the water of the bath evaporates, leaving a small quantity of glycerine in the emulsion coating.

Glycin, para-oxy-phenylamino-acetic acid. It is a white powder of minute thin plates, very slightly soluble in water but readily soluble in alkaline solutions. Almost insoluble in alcohol.

Gold Chloride.—The yellow crystals commonly sold in Great Britain are a compound of gold chloride and sodium chloride of the formula NaAuCl $_4$ 2 H $_2$ O. Each 15 grs. thus contains 7^1_2 grs. of gold metal. Another commercial form of gold chloride is the brown crystals of formula $HAuCl_4 \cdot 3H_2O$, likewise containing half their weight of gold metal.

Hydrochloric acid, i.e., muriatic acid, a solution in water of the gas HCl. The pure commercial acid has sp. gr. of 1·16 and is a strongly fuming corrosive liquid, which acts chemically and dissolves the oxides and carbonates of most of the metals. "Spirits of salt" is a crude form of hydrochloric acid, containing iron, etc., and is a powerful cleanser of glass vessels containing mineral deposits.

Hydrofluoric acid, strongly fuming and highly corrosive solution of hydrofluoric acid gas, HF. Commercially the acid is sold of a strength of 60 per cent. It must be kept in gutta-percha bottles, as it attacks glass and thus is used for detaching the gelatine film from glass negative. All contact of even a weak solution of the acid with the fingers must be avoided.

Hydroquinone, i.e., quinol, hydrokinone, hydrochinon, dihydroxy-benzene, $C_6H_4(OH)_7$, Fine white needle crystals, dissolving in about 18 parts of water, in two parts of 90 per cent alcohol, or in 6 parts of acetone. Hydroquinone, if pure, should dissolve completely in ether.

Hypo, hyposulphite of soda, sodium thiosulphate, Na₂S₂ O₃. 5H₂O. Obtainable as small pea crystals or as much larger crystals of hexagon shape. Extremely soluble in water, which dissolves nearly twice its weight of hypo. The solution becomes thereby chilled, that it is better to use warm or hot water in dissolving hypo. acids and acid salts decompose hypo, giving rise to sulphurous acid (odour of burning sulphur) and to a yellowish deposit of sulphur in the solution. Sulphurous acid and its acid salts have not this effect on hypo. In photography hypo is used as a chemical solvent of the silver bromide or silver chloride in the emulsions of plates or papers. It is a much less active solvent of silver iodide. Hypo is also obtainable in the dry or anhydrous form i.e., without the 5 molecules of water of crystallisation. The dry variety is a white powder, which dissolves in water much more rapidly than the crystals. In fixing, 3 parts of the dry are equivalent to about 5 parts of the cryst.

Iodine, greyish violet flakes of plates of metallic lustre. It is insoluble in water but dissolves readily in alcohol. It is also readily soluble in a solution of potass iodide. By mixing the iodine flakes with about three times their weight of iodide crystals and adding just enough water to cover the latter, the iodine dissolves at once, remaining in solution when adding further water. With starch iodine forms an intensely blue compound. Iodine stains on fingers, etc., disappear in hypo or sulphite.

Lead acetate, sugar of lead,

Pb $(C_2 \ H_3 \ O_2)_2 \ 3H_2O$. Clear white crystals dissolving in $1\frac{1}{2}$ times their weight of cold water; hot water should not be used. When using tap water, the solution will be slightly milky from formation of lead chloride, sulphate or carbonate. Slightly soluble in alcohol and soluble in glycerine.

Liver of sulphur, Potassa sulphurata, or potassium sulphide, containing small proportions of sulphate and carbonate of soda, hypo and polysulphide compounds. Sold in pieces of reddishbrown colour, very soluble in water.

Mercuric Iodide, bi-iodide of mercury, HgI₂. Bright red powder insoluble in water, but dissolving readily in solution of potass iodide, hypo or soda sulphite. The solution in sulphite forms the Lumière mercury intensifier. Intensely poisonous.

Mercury bichloride, mercuric chloride, mercury perchloride, HgCl₂. Heavy fibrous pieces or crystalline powder. One part requires 16 parts of cold water, but less than 2 parts of boiling water for solution. Much more soluble in cold water if hydrochloric acid ammonium or chloride is added. Very soluble in alcohol; less so in ether. The solutions are intensely poisonous and should on no account be allowed to come in contact with broken skin.

Metol, mono-methyl-paramido-phenol sulphate. White crystalline powder, readily soluble in cold water, but almost insoluble in alcohol or ether. Metol dissolves with some difficuly in sulphite solution. Hence, in making up developers, the metol should be dissolved with small proportion of sulphite.

Nitrie Acid.—Strongly corrosive and fuming liquid, mixing in all proportions with water. The commercial strong pure acid of 1·42 sp. gr. contains 71 per cent. of real acid, HNO₃. Nitric acid acts vigorously on almost all metals and metallic oxides and carbonates, dissolving them with formation of nitrates. It is a powerful oxidiser of organic substances. Burns the skin and clothes.

Oxalic acid, white crystals, (H·COOH)₂ dissolving in 10 parts their weight of cold water and in one-third their weight of hot water. Solutions made with ordinary tap water are milky from formation of oxalate of lime. On standing, the latter settles as a white deposit from which the almost clear solution can be poured off.

Paramodiphenol (base).— Yellowish-white crystalline powder, C6H4OHNH2. Very slightly soluble in cold water; dissolves more freely in hot water. Dissolves in alcohol: less soluble in ether. The hydroparamidophenol, chloride of which is the compound used in photography, is a crystalline powder readily soluble in 4 or 5 times its weight of water. Its keeping properties are much better than those of the free base, and is used for making concentrated single-solution developers in conjunction with a caustic alkali.

Potass. bichromate, bichromate of potash, potass dichromate, red chromate of potash. K₂ Cr₂ O₇. Large orange-red crystals dissolving in about 14 parts of cold water; soluble in their own weight of hot water. By addition of ammonia the reddish orange

colour of bichromate solution is changed to yellow, due to formation of mono or neutral chromate. Mixed with an acid, bichromate is a powerful oxidising agent. A saturated solution, mixed with about 1-20th of its volume of strong sulphuric acid, is a powerful cleanser of almost all kinds of dirt from bottles. It can be used repeatedly until exhausted.

Potass. bromide, bromide of potash, KBr. Small colourless crystals, dissolving in 1½ times their weight of cold water; very slightly soluble in alcohol; soluble in 3 to 4 parts of glycerine.

Potass. earbonate, carbonate of potash, K₂ CO₃. Granular White powder which rapidly becomes moist by absorbing water from the air and must be kept closely stoppered. Dissolves in less than its own weight of cold water. The above refers to potass. carbonate sold as "dry" or anhydrous. This is the variety to be used in photographic formulæ. The so-called "cryst" potass-carbonate is of uncertain composition.

Potass. chloro-platinite, protochloride of platinum and potassium, K₂PtCl₄. Small red crystals, dissolving in about 6 times their weight of cold water; insoluble in alcohol. The salt should contain nearly half its weight (46 per cent.) of platinum metal. Solutions should be made in distilled water and, with addition of a drop of hydrochloric acid, kept in well stoppered glass bottles.

Potass. cyanide, cyanide of potash, KCN. Sold as white hard pieces (fused), of qualities

equivalent to 30 per cent. Ιt is very soluble in water or alcohol. Cvanide is intensely poisonous, the solution should not be allowed to come into contact with broken skin. further danger is the production prussic acid vapour on addition of an acid to cyanide solution. Cyanide is a powerful solvent of silver bromide and silver chloride and also of silver but its perceptible solvent action on the developed silver image makes it a less desirable fixing agent then hypo.

Potass. ferricvanide. prussiate of potash, K3 Fe C6 N6. Deep ruby red crystals, usually covered with a slight reddish coating. It is best to rinse the crystals in water before dissolving them; they are then seen to be clear ruby red. Ferricyanide dissolves in 21 times its weight of cold water, forming a yellowish brown solution if strong; greenish yellow, The solution does not keep very well; it should be kept in the dark. The keeping quality is improved by dissolving some ordinary salt along with the ferricyanide.

Patass. ferrocyanide, ferrocyanide of potash, yellow prussiate of potash, K₄ Fe C₆ N₆. 3H₂ O. Large lemon-yellow crystals, dissolving in 3½ times their weight of water. Insoluble in alcohol. By addition of an acid, solutions of ferrocyanide slowly give off slight fumes of the intensely poisonous prussic acid gas.

Potass.iodide, iodide of potash. KI. Small white crystals, dissolving in less than their own weight of water. Slightly soluble in alcohol. Changes in the light, becoming slightly yellow. This is immaterial for its chief use in photographic work, viz., dissolving iodine.

Potass. metabisulphite, K2S2O8. White crystals which should be transparent, but usually have a slight incrustation, rendering them opaque. Dissolves fairly readily in cold water forming an solution smelling acid sulphurous acid. Due to its acid nature, potass. metabisulphite neutralises its own weight of cryst soda carbonate, half its weight of caustic potash, onethird its weight of caustic soda. or three-tenths its weight of dry potass carbonate. Is partially decomposed by hot water, which should not be used for dissolving

Potass. oxalate, neutral oxalate of potash, $K_2C_2O_4 \cdot H_2O$. Colourless crystals dissolving in three times their weight of cold water; much more soluble in hot water. When dissolved in tap water, containing lime there is a considerable deposit of calcium oxalate. This settles in a few hours, when the almost clear solution can be poured off.

Potass permanganate, permanganate of potash, K₂Mn₂O₈. Small purple red crystals of metallic lustre. About 16 parts of cold water are required to dissolve 1 part of the crystals, but a strong solution is much more quickly made in hot water. The solution stains fingers, etc., a deep brown, the stain can be removed with a solution of metabisulphite or of oxalic acid. or by rubbing with crystals of these substances. A solution of permanganate, especially if made acid with sulphuric acid, instantly removes developer and

other stains from dishes. It leaves its brown stain, which is cleared off with metabisulphite or oxalic acid.

Pyrogallic acid, pyrogallol, tri-hydroxy-benzene, C6H3(OH)3. Obtainable in two forms—(1) sublimed, fine feathery crystals, an ounce by weight of which occupies about 10 ozs. bulk, (2) crystallised, much denser of about 1-10th the bulk. The properties of the two forms are the same. Extremely soluble in water and alcohol. The solution in water oxidises very rapidly and cannot be kept except with the aid of preservatives, such as sulphites, nitric acid, etc. When making up developers, the pyro should be added after these preservatives have been mixed with the water.

Silver nitrate, nitrate of silver. Transparent or semi- $AgNO_3$. transparent colourless crystals, dissolving in less than half their weight of water. make a clear solution, distilled water must be used; the chlorides in most tap waters cause a milkiness. Solutions should be kept in glass-stoppered bottles in the dark. nitrate causes intense brown or black stains on fingers or clothes; these can be removed by rubbing with tincture of iodine followed by strong solution of hypo.

Sodium acetate.—Colourless transparent crystals, NaC₂H₃O₂. 3H₂O, dissolving in less than three times their weight of cold water. Much more soluble in hot water.

Sodium bicarbonate, bicarbonate of soda, NaHCO₃. By grocers bicarbonate is sold as "carbonate of soda." Fine white powder requiring about

11 times its weight of cold water for solution. In hot water it is partially decomposed, forming ordinary soda carbonate. carbonate is very feebly alkaline, but neutralises acids. For this reason it is used in hypo baths for the fixation of self-toning the papers: bicarbonate neutralises the acid from the papers, without. however. making the fixing bath strongly alkaline.

Sodium bisulphite, NaHSO₃ is obtainable in the solid state, but more readily as a solution called soda bisulphite lye of average density, 36 deg. Baumé (=1·33 sp. gr.). This is a colourless or pale yellow liquor which can be used instead of soda sulphite. But unlike sulphite it is acid, neutralising a certain proportion of the alkali of a developer.

Sodium carbonate, i.e., carbonate of soda, sold in two forms, crystal, Na2CO3 10H2O, and dry or anhydrous, Na₂CO₂. Washing soda is a somewhat impure form of cryst soda carbonate, which, for photographic use, should be in small clear crystals dissolving in water to a perfectly clear solution. The dry" carbonate is a coarse powder which actively absorbs water, and must be kept well stoppered. One part of the dry carbonate is equivalent to slightly more than 21 parts of the cryst, e.g., in making up a developer ·37 oz. (=160 grs.) of the dry is to be used in place of 1 oz. of the cryst and vice versa. The dry carbonate dissolves in about 6 times its weight of cold water; the cryst in 11 times. In the United States another strength of soda carbonate is commonly used as "monohydrated." It is Na₂CO₃. H₂O₁ containing 85 per cent. dry or anhydrous carbonate. 1 oz. of this monohydrated carbonate is equivalent to 2½ ozs. of soda carbonate cryst, or 1 oz. of the latter to .43 oz. (190 grs.) of the desiccated.

Sodium phosphate, i.e., phosphate of soda, di-sodium phosphate, neutral phosphate of soda, Na₂HPO₄·12H₂O. Large clear colourless crystals dissolving in about 7 times their weight of cold water. The solution is faintly alkaline.

Sodium sulphide.—The pure substance is in small colourless crystals, Na₂S.9H₂O, which rapidly become moist by: exposure to the air. Exceedingly soluble in water. Soda sulphide keeps well in strong solution, e.g., of 20 per cent. strength, but rapidly oxidises in a weak solution. This is why the working bath in sepia toning should be made up at the time of use by mixing a little strong sulphide solution with the required quantity of water. The yellowish commercial quality is sometimes used for precipating silver residues in solution.

Sodium sulphite, i.e., sulphite of soda, Na₂SO₃·7H₂O. This cryst, sulphite should be in clear crystals, which should be kept well corked, otherwise they become dull and powdery from partial oxidation. Sulphite which has become slightly encrusted may be rinsed for a few seconds in a measure with enough cold water to cover it, the water poured away, and the crystals dried on a clean cloth for weighing out. Cryst sulphite is most soluble in water at about 100 deg. F., about as hot as the hand can comfortably bear.

Dry or anhydrous sulphite. Na_2SO_3 , is a white powder which dissolves in water more readily than the cryst. One part of it is equivalent to 2 parts of the crystal.

Starch.—Fine white powder, $C_{10} H_{10} O_5$, which is insoluble in cold water, but in boiling water forms a kind of solution which, if strong, is a fairly stiff jelly or paste (starch mountant). Pure starch powder should be used for making mountant, not the granular laundry starch.

Sulphuric acid.—Thick highly corrosive heavy liquid of 1.84 sp. gr. containing 98 per cent. of the real acid, H2SO4. This strong acid absorbs water rapidly from the air, becoming thereby weaker. When mixed with water, great heat is developed. The acid should always be added to the water. If water is added to the acid, the great heat may crack the vessel, and throw out part of the contents with almost explosive violence.

Sulphurous acid, solution in water of the gas SO₂. The saturated solution has sp. gr. of 1.046, equivalent to 9.5 per cent. sulphurous acid, H₂SO₃, but it rapidly loses strength by escape of SO₂ and by oxidation.

Tartaric acid.—Dry white crystals. (CH₂COOH)₂ soluble in less than their own weight of cold water, sparingly soluble in alcohol or ether, but freely soluble in glycerine.

Thiocarbamide, thio - urea, sulpho-carbamide, CS (NH₂)₂. Small colourless crystals requiring about 11 parts of their weight of cold water for solution, very soluble in hot water and in alcohol. In solution with an acid thiocarbamide removes developer stain.

MISCELLANEOUS INFORMATION.

Copyright in Photographs.

1. Copyright (the right to copy in any form) subsists in photographs because such right is recognised as a species of property by the law of England (and of most other countries).

In Great Britain, the law is embodied in the Copyright Act of 1911 (H.M. Stationery Office, Kingsway, London, 3d.) which came into force July 1, 1912.

2. The Copyright Act has been adopted (in some cases with alteration) by the Dominions of Canada and New Zealand, Union of South Africa and Commonwealth of Australia. Copies of the Acts may be obtained from the offices of the respective governments in Ottawa, Dunedin, Pretoria and Canberra. The effect of these Acts is that copyright created in Great Britain extends to those parts of the British Empire.

the mere act of taking the photograph. There is nothing else that should or can be done. It is not necessary to mark photographs "Copyright" in order to create or maintain the copyright in them. There must be copyright in every photograph that is taken, and the copyright must belong to some person.

4. Copyright is the "sole right to produce or reproduce the photograph or any substantial part thereof in any material form whatsoever."

5. Copyright in photographs

lasts for 50 years from the making of the original negative.

6. Anything which is not itself copyright may be photographed, and the photograph will be copyright. This applies to people's faces (taken with or without their permission), any scene or landscape, works by the Old Masters of paintings—anything which is not a painting, drawing, or other work in which there is copyright. But note:

(a) You may take a photograph from an unusual point of view and of course obtain copyright in your picture. But anyone else may afterwards photograph the scene from the same standpoint, and he obtains copyright in his picture.

(b) A photographic copy of an Old Master is itself copyright, if it is made by photographing the original, but a photograph of another photograph of the original would (most probably) be an infringement of the copyright in the latter and, therefore, would not be entitled to copyright.

7. Although there is copyright in "architectural works of art" (buildings), the taking of photographs of such buildings is specially permitted by the Act. The same applies to works of sculpture if "permanently situate in a public place."

8. Copyright in a photograph includes copying in another style, a.g., as a drawing in line or wash or in colours, or as an etching, or larger or smaller.

Moreover, the copy need not be exact to be unlawful. It may be different, but if it is a "colourable imitation," i.e., recognisable as having been made from the photograph, it is unlawful.

9. The copying of part of a photograph, e.g., a face in a group, is also unlawful.

10. Anyone who takes a photograph at his own expense, not to the order of anyone, nor as an employee of somebody, automatically becomes the owner of the copyright.

11. But if the photograph is ordered and is made "for valuable consideration" in pursuance of the order, the copyright automatically becomes the property of the person giving the order; or of the employer, if made by an employee in course of his employment.

12. The copyright continues to be the property of the customer, even though he fails to pay. The photographer is not entitled to take the copyright because the customer has not paid. The two things are distinct.

13. Although not the subject of copyright law, the negatives which a photographer makes in executing an order, by common law and long trade custom, are his property, unless in the first instance he contracted to surrender them. But they cannot be used for any purpose except as the customer directs or permits.

14. The copyright in a photograph may be sold outright or piecemeal (i.e., for various limited purposes), but any such transfer is not valid unless in writing.

For example, a photographer may tell a sitter who has come

in the usual way that he will charge less if he obtains the copyright. Both parties may agree to this arrangement, but unless a sitter signs a form of words to this effect, he or she is (and continues to be) the owner of the copyright.

15. Any copying or reproduction of a photograph without the permission of the owner of the copyright is an infringement of the latter. It is also an infringement for anyone to sell or show for sale copies that they know to be infringements.

When a photograph has been published without permission, the infringer should be asked what compensation he will make-not asked for a particular sum. It is usual to accept twice the fee which would have been charged in the first instance. Anyone concerned in reproducing photographs may be expected to know that there must be copyright in every photograph of recent date. His only defence is that he had permission from someone he thought to be the owner of the copyright.

17. In any action for infringement, the plaintiff is assumed to be the owner of the copyright; it is left to the defendant to show that he is not.

18. Copyright created in Great Britain or in British Dominions also extends to all the countries subscribing to the International Copyright Convention, viz., to the chief countries of the world, with exception of the United States of America and Soviet Russia. According to the Convention, a resident national of any country observes the formalities in his country (none in Great Britain), and obtains in all the other

countries the degree of protection granted to their nationals. As a consequence of this Convention, the rights in photographs by people of almost every nationality must be respected in almost every country.

19. As regards the United States, there are various special reciprocal agreements between the U.S. and a number of countries, according to which those who are not American citizens can obtain copyright in the United States by observing the formalities in force there, viz., registration of the photographs in Washington and marking of prints to show that they (Particulars copyright. are from the U.S. Registrar of Copyrights, Washington). Re-American citizens ciprocally, copyright Great in obtain Britain and in the other countries which have entered into this arrangement.

Reproduction Fees.

According to an agreement concluded in June 1929 between associations representing London and provincial newspapers and the Proprietors Association of Press Photographic Agencies the minimum fees payable for the reproduction of photographs are as follows:—

| London. | | |
|------------------------|------|------|
| Stamp-heads. Up to | | |
| 2½ sq. ins | 12s. | 6d. |
| Portraits up to 15 sq. | 11.5 | 1.14 |
| ins | 15s. | 0d. |
| Any picture up to 30 | 4 1 | |
| sq. ins | 17s. | 6d. |
| Any picture over 30 | 4.14 | |
| up to 50 sq. ins | 27s. | 6d. |
| Any picture over 50 | 1:00 | |
| up to 80 sq. ins | 42s. | Od. |
| Any picture over 80 | 相外的 | |
| sg. ins | 90s. | Od. |

PROVINCES.

The fees for first publication of photographs in Provincial or Scottish morning, evening or Sunday newspapers shall be:—Stamp-heads. Up to

| banday newspapers sir | an oc | |
|------------------------|-------|-----|
| Stamp-heads. Up to | | |
| $2\frac{1}{2}$ sq. ins | 7s. | 6d. |
| Any picture other | | |
| than a stamp-head | | |
| up to 50 sq. ins | 10s. | 6d. |
| Any picture over 50 | | |
| up to 80 sq. ins | 15s. | 0d. |
| Any picture over 80 | | |
| sq. ins | 17s. | 6d. |
| | | |

Reprints (for photographs reproduced on or after January 1st, 1929):—

| LOND | ON. | |
|--------------------|-------|---------|
| Stamp-heads | | 7s. 0d. |
| Pictures of any la | rger | |
| size | | 8s. 6d. |
| Provi | NCES. | |
| Stamp-heads | | 5s. 0d. |
| Up to 25 sq. ins. | | 6s. 0d. |
| Over | | 7s. 6d. |
| | | |

The newspapers have offered similar terms to photographers in general except that *all* photographs supplied previous to and after October 1st, 1929, are subject to above reprint rate.

Weekly newspapers such as the *Sphere* pay a minimum fee of 10s. 6d. not exceeding 3 sq. ins.

14s. 0d. between 3 and 12 sq. ins. 17s. 6d. ,, 12 and 30 ,, ,, 30s. 0d. ,, 30 and 60 ,, ,, 60s. 0d. ,, 60 and 90 ,, ,, 100s. 0d. over 90 sq. ins.

Other weekly publications (not trade papers) pay:—

10s. 6d. not exceeding 3 sq. ins. 14s. 0d. between 3 and 30 ,, ,, 25s. 0d. ,, 30 and 60 ,, ,, 50s. 0d. ,, 60 and 90 ,, ,, 90s. 0d. over 90 sq. ins.

Trade papers pay:—
10s. 6d. not exceeding 30 sq. ins.

21s. 0d. between 30 and 60 sq. ins. 42s. 0d. ,, 60 and 90 ,, ,, 84s. 0d. over 90 sq. ins.

Minimum rates for photographs for advertisements, use on calendars, picture postcards, etc.

Advertisements in Newspapers and Periodicals.

Where a single photograph is supplied to be used in not more than three insertions of an advertisement, a minimum fee of £1 ls. is to be charged per insertion.

Where more than one photograph is supplied by the same firm for use in not more than three insertions of the same advertisement, a minimum fee of 10s. 6d. is to be charged for each insertion of each photograph after the first photograph, the first photograph being charged at a minimum fee of £1 ls. per insertion.

Where a single photograph is supplied to be used in more than three insertions of an advertisement, a minimum fee of £3 3s. to be charged.

Where more than one photograph is supplied by the same firm for use in more than three insertions of the same advertisement, a minimum fee of £1 11s. 6d. is to be charged for each photograph, the first being charged at £3 3s. 0d.

Use on Calendars, Picture Postcards, Christmas and Greeting Cards and Valentines.

Calendars.—A minimum fee of £2 2s. per photograph, with exclusive calendar use for one year. If supplied without exclusivity, a minimum fee of 10s. 6d. to be charged for each photograph.

Picture Postcards.—A minimum fee of 10s. 6d. per photograph.

Christmas and Greeting Cards and Valentines.—A minimum fee of 10s. 6d. per photograph.

Cigarette Stiffeners.—A minimum fee of 10s. 6d. per photograph, up to a minimum of 25 subjects.

Advertising Posters.—Up to single crown size, a minimum fee of £2 2s.; double crown, minimum fee of £3 3s.; 16-sheet poster, minimum fee of £10 10s.; 48-sheet poster, minimum fee of £21 0s.

Factory Acts.

Premises in Great Britain where persons are *employed* in photographic work come within the regulations of the Factory and Workshop Act, 1901 (H.M. Stationery Office, 2s.). The Act does *not* apply to premises where assistants are *not* employed (one-man businesses).

Premises are classified as "factories" (places where mechanical power, including electric, is used) and "workshops" (places where power is not used.) The Act applies to both. Thus dark-rooms, printing-rooms are "workshops" but if fitted with power-driven apparatus (e.g., drying machines, washers) are "factories."

The Act regulates hours and conditions of employment (as regards hygiene and safety) and requires particulars to be kept in a prescribed Register, as to the "young persons" employed and dates of periodical painting or lime-washing. Any accidents must be reported to the Inspector for the district.

H.M. Factory Inspectors are to a large extent technical experts and it is always well to welcome their inspection and to invite their approval beforehand of new premises or changes in existing workshops.

Although not stated in the Act, the studio of a portrait photographer is not regarded administratively as coming under the Act, but studios of commercial photographers and photo-engravers are subject to the Act.

The following are the principal requirements which apply to photographic premises.

Notices .- There shall be displayed on the premises, so as to be read by employees, abstract of the Factory and Act, name and Workshop address of district Inspector and particulars of the day and time of the weekly half-holiday. A General Register must also be kept of the particulars of "young persons "-boys and girls-over 14 and under 18 years of age, employed. Particulars of the painting or lime-washing of workrooms must also be entered in the Register, and also details of any accident occurring to persons employed. The Register must be kept available and produced when demanded by the Inspector.

Hours of Employment.—There is no restriction as to the employment of men—including boys over 18 years of age. Permissible hours of employment for women and young persons for full days are 6 a.m. to 6 p.m., 7 a.m. to 7 p.m., or 8 a.m. to 8 p.m., with 1½ hours interval for meals, of which at least 1 hour shall be before 3 p.m. On Saturdays (or other day appointed as half-holiday,) 6 a.m. to 2 p.m., 7 a.m. to 3 p.m., or 8 a.m. to 4 p.m.

with half an hour interval for meals. Times of employment and meals must be stated on the abstract affixed in the works.

Overtime.—In certain trades, classed as "seasonal," the period of employment of women on full days may be 2 hours longer than stated above on not more than 30 days in the year, with 2 hours interval for meals. At present photography is not classed as a seasonal trade under the Act.

Sundays.—A woman, young person, or child shall not be employed on Sunday, but there is no restriction for men.

Young persons (see above) must be certified (by the certifying surgeon appointed under the Act) as fit for employment. This is done by the Surgeon signing the General Register. The name and address of the Certifying Surgeon are shown on the Abstract of the Act, or may be obtained from the Factory Inspector. A nominal fee is chargeable by the Surgeon.

Accidents must be reported to the Inspector if such as to incapacitate an employee from following his ordinary occupation for 5 hours on any one of the three working days next after the occurrence of the accident.

Hygiene and Safety.—The Act requires sufficient cubic space, e.g., 250 cub. ft., per employee, reasonable temperature and ventilation and precautions against fire in premises: also the fencing of any moving part of a machine considered dangerous to employees. Precautions against fire apply particularly to the handling of celluloid films and plates, where smoking, use of naked lights, etc., should be prohibited. The possibility of

fire is greatest in the handling of roll-film. Fires from stocks of the thicker cut or portrait film negatives when stored with observance of due precautions (see below) are of rare occurrence.

Special Regulations. - In places where celluloid in the form of roll-film or cut film is used the Celluloid Regulations are operative (see below). These include fire-resisting storage, prohibition of naked lights and other sources of ignition unless adequately protected, smoking in work-rooms and particularly easy means of exit, all workroom doors opening outwards or sliding. The Inspector should be consulted and his advice asked for on these matters. The Cinematograph Film Regulations do not apply to still photographic work nor to the manipulation of nonflam film.

Storage of Celluloid.

In Great Britain the storage of celluloid in the form of sensitive film or celluloid negatives is subject to the regulations set forth in "Statutory Rules and Orders, 1921, No. 1825." (H.M. Stationery Office, London, Edinburgh, Manchester, Cardiff and Belfast, price 1d.) under Section 79 of the Factory and Workshop Act.

A memorandum prepared specially for the information of professional photographers on the storage of celluloid on premises to which the Factory and Workshop Acts apply is obtainable from the Home Office, Whitehall, London, S.W. 1.

As regards sensitive films kept on premises in quantity which as a rule does not exceed 14 lbs. storage in a drawer or cupboard in a private office or other room in which no handling of celluloid is done is officially regarded as complying with the requirement for "safe storage."

The regulations in respect to developed negatives will depend to some extent on the amount of such negatives. Where the latter are of considerable weight, they require to be kept in a fire-resisting store, such as a cabinet or cupboard constructed of fireproof material, e.g., sheet metal, asbestos sheeting, or wood effectively treated to resist flame. This store requires to be of sound construction and is to be kept locked. The door or lid needs to be so arranged that there is no naked light or open fire near at hand. The store should not be situated in a workroom where celluloid is handled nor on a stair, nor near a door, nor in a passage through which persons might have to pass to escape in the event of a fire. The nature of the contents should be clearly marked on the outside of the store, and a cautionary notice put up pro-hibiting the use of naked lights. An adequate supply of buckets of water should be kept always available close outside the store, water being the best extinguisher of celluloid.

The foregoing recommendations are for general guidance and are subject to modification, according to the quantity of celluloid, or on account of the design of the building or nature of the processes, at the discretion of the District Inspector Factories.

Premises may be exempted from the above regulations on the authority of the Chief Inspector of Factories, Home Office, Whitehall, London, S.W. 1.

The Shop Acts.

(Great Britain.)

Under the Shop Acts of 1911 and 1912, the parts of a photographer's premises in which goods are sold to the public is a "shop." As such, it must be closed one half-day in each week from 1 p.m. unless exempted on certain grounds.

It has, however, been held that a photographer may admit sitters to his establishment on the weekly half-holiday by previous appointment, but must not keep the "shop" open for chance passers-by.

Assistants in a "shop," that is to say receptionists and others who take orders from customers, or despatch goods, are entitled under the Act each week to one half-day holiday beginning not later than 1.30. The half-holiday may be on the half-day closing day or on another day of the week. The employer is required to put up a notice in his shop stating the days when his assistants are to have their half-holiday.

In holiday resorts in which an Order allowing shops to keep open during the holiday season on the weekly half-holiday is in force, an employer who satisfies the local authority that he gives his assistants a holiday on full pay of not less than two weeks during the year and posts a notice to that effect in his shop, need not give his assistants a half-holiday during the time the Order is in operation.

The Shop Acts are administered by local authorities: applications for information on particular points should be made in the photographer's district.

Registration of Business Names.

(Great Britain.)

Under the Registration of Business Names Act, 1916, it is required that persons who carry on a business in Great Britain under a name which is not their true name or the name by which they have always been known shall register the business with the Registrar of Business Names.

It is required that a person or partnership shall register if the "business name" includes any addition to the name of the person or names of partners. Thus Joseph Jones if he trades as "Jones & Co." must register.

Also every individual or firm who, or a member of which, has either before or after the passing of the Act changed his name must register. This does not apply to women who change their name by marriage.

The cost of registration is 5s. Offices of the Registrars are: England and Wales, Princes House, 37 Kingsway, W.C. 2; Scotland, Exchequer Chambers, Parliament Square, Edinburgh; Northern Ireland, 15 Donegal Square West, Belfast; Irish Free State, Coleraine House, Dublin.

Registered firms must state in all catalogues, circulars, show cards and business letters, on which the name appears, the christian name, or initial and surname of the proprietor; and of all partners, in businesses belonging to more than one person.

If the individual 'proprietor' or partners are not British

the nationality must also be stated on business stationery; and if there has been a change of nationality, the original nationality

Fines not exceeding £5 may be inflicted for failure to register, or non-observance of these provisions.

Photographers who come within the Act are not required to publish their true name on photographs, postcards, etc.

Passport Photographs.

The space provided for photographs on British passports measures $2 \times 2\frac{3}{4}$ inches. Photographs require to be unmounted and on thin paper.

Exhibitions.

The chief exhibitions held in England are:—

Royal Photographic Society. Pictorial and technical. September-October. Secretary: H. H. Blacklock, 35, Russell Square, London, W.C.

London Salon. Pictorial only. September-October. The Secretary, 5A, Pall Mall East, London.

Northern. Pictorial and technical. Organized by Bradford P.S. or Manchester A.P.S.

Scottish Salon. Pictorial only. January. Organized by Scottish Photographic Federation.

Midland. Chiefly pictorial. September. Organized by Midland Counties Federation.

The Professional Photographers' Association. Portraiture and commercial. September. The Secretary, 49 Gordon Square, London, W.C. 1.

In France.

Paris Salon. Pictorial only. October. Société Française de Photographie.

Text-Books.

Those of the books in the following list which are still in print are obtainable by order from all photographic dealers. But a very large number are now out of print, though obtainable, in many cases, from dealers in second-hand books.

Elementary and General.

Photography, Theory and Practice. L. P. Clerc. Ed. George E. Brown. 35s.

grapher. Will R. Rose. 2s. 6d.
Amateur Photography. F. T.
Beeson and A. Williams. 2s. 6d.

Photography Made Easy. R. Child Bayley. 2s.
Ilford Manual of Photography.

New edition. 2s.

Amateur Photographic Handbook.

1s.
Sinclair Handbook of Photography. 1s. 6d.

All about Photography. P. R. Salmon. 2s. 6d.

Barnet Book of Photography. 3s.
The Photographic Instructor. J.
I. Pigg. 4s.

A Primer of Photography. Capt. Owen Wheeler. 3s. 6d.

Photographic Technique. L. G. Hibbert. 2s. 6d. Photography: Principles and

Photography: Principles and Practice. C. B. Neblette. 30s. Instruction in Photography. W.

de W. Abney. 7s. 6d.

Dictionary of Photography. E.
J. Wall. 7s. 6d.

Photography: Principles and Applications. A. Watkins. 10s. 6d. History of Photography. W.

Shepperley. 10s. 6d.

Photography as a Business.

Arthur G. Willis 5s.

Arthur G. Willis. 5s.

Photography as a Scientific

Implement. 30s.
The Camera as Historian. H. D.
Gower. L. Stanley Jast, and

Gower, L. Stanley Jast, and W. W. Topley. 6s.

The Kingdom of the Camera. T. Thorne Baker. 7s. 6d.

Optics and Chemistry.

Fundamentals of Photography. C. E. K. Mees. 4s.

Camera Lenses. A. Lockett. 2s. 6d.

Photographic Lenses. Conrad BeckandHerbertAndrews. 1s.

The Optics of Photography and Photographic Lenses. J. Traill Taylor. 3s. 6d.

Soft-focus Lenses. (No. 184 of Photo-Miniature.)

Modern Telephotography. Capt. Owen Wheeler. Is. 6d.

Telephotography. C. F. Lan-Davis and Carter. 3s. 6d.

Photographic Chemicals and Chemistry. T. L. J. Bentley and J. Southworth. 3s. 6d.

The Chemistry of Photography. R. Meldola. 6s.

Photographic Researches of Hurter and Driffield. W. B. Ferguson. 25s.

Special Branches.

Studio Portrait Lighting. Herbert Lambert. 15s.

Commercial Photography. D. Charles. 10s. 6d.

Complete Press Photographer. Bell R. Bell. 6s. Infra-Red Photography. S. O. Rawling. 3s. 6d.

Practical Infra-Red Photography. Dr. O. Helwich. 4s.

The Real Pictorialism. F. C. Tilney. 1s.

Pictorial Composition in Photography. Arthur Hammond. 15s.

Principles of Photographic Pictorialism. F. C. Tilney. 25s.

Photographic Amusements. F. R. Fraprie and W. E. Woodbury. 15s.

Photography on Tour. 6d.

The Portrait Studio. Practicus of the B.J. 1s.

Studio Construction. (No. 182 of Photo-Miniature.)

Portraiture, Parts I and II. F. C. Tilney. 1s. each.

Lighting in Photographic Studios. P. C. Duchochois. 1s. 6d.

The Studio, and what to do in it.

H. P. Robinson. 3s. 6d.

Flashlight. J. J. Curtis. 1s. Magnesium Light Photography. F. J. Mortimer. 1s. 6d.

Reflex Cameras. (No. 151 of Photo-Miniature.)

Speed Photography. (No. 1, New Photo-Miniature.)

Photography of Moving Objects and Hand-camera work for Advanced Workers. Adolphe Abrahams. 2s. 6d.

How to Make Good Pictures. (Kodak.) 2s.

Nature Photography for Beginners. E. J. Bedford. 7s. 6d. Stereoscopic Photography. A.

W. Judge. 21s. Photo-micrography. E. J. Spitta.

Photo-micrography. E. J. Spitta 12s.

Aerial Photography. C. Winchester and F. L. Mills. 25s. Airplane Photography. H. E. Ives. 18s.

Modern Miniature Cameras. R. M. Fanstone. 3s. 6d.

Free-lance Journalism with a Camera. R. H. Mallinson. 3s. 6d.

X-vays. W. Schell, 7s. 6d.

Negative Processes.

Wet Collodion Process. Arthur Payne. 3s. Collodion Emulsion. H, Ο.

Klein. 5s. Photographic Emulsions. E. J.

Wall. 21s.

Perfect Negatives. Dr. B. T. J. Glover, 1s.

The Photography of Coloured Objects. C. E. K. Mees. 2s. 6d. Photographic Rendering of Colour in Monochrome. B. T. J.

Glover. 1s.

The Watkins Manual (of exposure and development). Alfred Watkins. 1s. 3d.

Physical Development. (No. 2, New Photo-Miniature.)

The Photographic Darkroom. E. J. Wall. 6s. Intensification and Reduction.

E. J. Wall. 5s. Retouching and Finishing for Photographers. J. Spencer

Adamson. 4s. Art of Retouching. Robert Johnson. 12s. 6d.

Printing Processes.

Pigment Printing. G. L. Hawkins. 10s. 6d.

Photographic Printing, Commercial and Professional. R. R. Rawkins. 3s. 6d.

Photographic Printing Processes. Owen Wheeler. 8s. 6d.

Print Perfection. Dr. B. T. J. Glover. 1s.

Toning Bromide Prints. R. Blake Smith. 1s. 6d.

Enlarging for All. Dr. B. T. J. Glover. 1s.

Enlargers and Enlarging of To-day. W. Alexander. 3s. 6d.

Carbon Printing. E. J. Wall. 1s. 6d.

Bromoil and Bromoil Transfer. L. G. Gabriel. 7s. 6d.

Bromoil Printing and Transfer. Dr. E. Mayer. \$2.50.

Bromoil and Oil Prints. Jas. A. Sinclair. 2s.

The Art of Pigmenting. Bertram Cox and F. C. Tilney. 1s. Oil, Bromoil and Transfer. Fred Judge and F. C. Tilney. 1s. Expression in Pigmenting.

Tilney. 1s. Oil and Bromoil Processes. F. J.

Mortimer and S. L. Coulthurst. 1s. 6d.

Oil and Bromoil Printing. 106 of Photo-Miniature.) Perfection in the Pigment Pro-

cesses. Chris. J. Symes. 1s. Kallitype Processes. (No. 185 of Photo-Miniature.)

Blue Printing and Modern Plan Copying. B. J. Hall. Photographic Enamels. d'Heliecourt. 1s. 6d.

Treatise on the Air-brush. S. W. Frazer and G. F. Stine. 12s. 6d.

Lantern and Cinematograph.

Optical Projection. R. S. Wright. 4s. 6d. Lantern Slides. Dr. B. T. J.

Glover. ls. Practical Slide-making. G. T.

Harris. 1s. 6d. Living Pictures. R. B. Foster, B.Sc. 6s.

Commercial Cinematography. G. H. Sewell. 7s. 6d.

The Guide to Kinematography. Colin N. Bennett. 10s. 6d. Amateur Cinematography. Capt.

Owen Wheeler. 6s. Cine-Photography for Amateurs. J. H. Reyner. 10s. 6d.

Filmcraft. Adrian Brunel. 3s. 6d. Making Home Movies. Ottley. 3s. 6d.

Percy W. Home Processing. 3s. 6d. Harris. Film - Play Production for Amateurs. G. H. Sewell. 5s. Cinematography and Talkies. J. R. Cameron and J. A. Dubray. \$4. Amateur Talking Pictures and Recording. Bernard Brown,

Process Work.

B.S.c. 7s. 6d.

Ilford Manual of Process Work.
L. P. Clerc. 7s. 6d.
Modern Illustration Processes.
Charles W. Gamble. 12s. 6d.
Horgan's Half-tone and Photomechanical Processes. S. H.
Horgan. 12s. 6d.
Photo-Mechanical Processes. W.
T. Wilkinson. 4s.
Elements of Photogravure. C. N.
Bennett. 5s.

Colour Photography.

Colour Photography. Capt. Owen Wheeler. 12s. 6d.
Practical Colour Photography. E. J. Wall. 15s.
Natural-Colour Photography. Dr. E. Konig. 3s.
Bye-Paths of Colour Photography.
"O. Reg." 5s.
The Technique of Colour Photography. F. R. Newens. 4s. 6d.
The History of Three-Colour Photography. E. J. Wall. \$15

Trade Booklets.

The following booklets of technical information are issued by the undermentioned firms in the photographic trade. Except where otherwise stated, the booklets are sent post free to any applicant.

Adhesive Dry-Mounting Co.

Dry-Mounting.
Border Tints and Mounting
Boards.

Agfa, Ltd.

Flashlight Photography. Rodinal Developer. Development in Bright Light. Agfa Films and Plates. Agfa Bromide and Gaslight Papers. Agfacolor Ciné Film. Agfacolor Plates and Films (Working Instructions). Agfa Cameras. Agfa Amateur Ciné Apparatus and Film. Agfa Accessories. Agfa Developing Tank for B2 Films. Agfa Movector Super 16 mm. Projector. Agfa Filters. Infra-Red Photography.

Aldis Bros.

Aldis Bros. and their Productions.

Aldis Lenses.
The Aldis Epidiascope.
The Aldis Camera Aiming Sight.

Autotype Co., Ltd.

The Carbon Process.
The Carbro Process, working instructions.
The Autotype Photo Stencil Process.
Oil Process Prints from Paper Negatives.

Burroughs Wellcome & Co.

Holiday Photography.
Economy in Photography.
Time Tables for Film Tank
Development.
Colours on Development Papers
and Lantern Slides.
Colours on Lantern Slides by
Development.
Prints in Colour.
"Tabloid" Chemicals.
Colour Photography.
Fine Grain Development.

"Tabloid" Desensitiser.

J. H. Dallmeyer, Ltd.

The Eye of the Camera. Why a Telephoto Lens?

Lenses, Cameras, Projectors and Apparatus for Cinematography.

Dallmeyer Lenses and Apparatus How Lenses are Made.

Why you should insist on Dallmeyer Lenses.

The Care of Dallmeyer Lenses.
Photography Simplified (The Dallmeyer Snapshot Camera).
Ombrux and Blendux Exposure Meters.

Parvux Illumination Meter.

Elliott & Sons, Ltd.

How to make Snapshots that Sell.

Finlay Colour Process.

Guide to the Finlay Process (6d.)

Gevaert, Ltd.

The Gevaert Book of Photography (1s.) Vittex Paper. X-ray Films.

Graphic Products (photo-mechanical).

Photographic Papers for the Amateur.

Gevaert Films for Miniature Cameras.

Gevaert Films and Ciné Films. Gevaluxe Velours.

Grant, Thos. K.

Lumière Filmcolor. Lumicolor Film Instructions.

Hewittic Electric Co.

Studio Lighting.

Ilford, Ltd.

Ilford Exposure Tables.
Ilford Plates and Films.
Ilford Hypersensitive Panchromatic Films.
Selo and Selochrome Films.
Selo Hypersensitive Panchromatic Roll Film.

Selo Fine-Grain Panchromatic Roll Film.

Ilford Colour Filters.

Colour Filters, with Special Reference to their Use in Photography.

Ilford Bromide and Clorona Papers.

Selo 9.5 mm. Ciné Reversal Films.

Dufaycolor Roll Film and Film Packs.

Selo Infra-Red Roll Films.
Slides and Transparencies on
Ilford Lantern Plates.
Recent Developments in Infra-

red Photography.
Infra-red Photography.
Evidence by Infra-Red.

Toning Ilford Bromide and Chlorona.

Head Products for Process and

Ilford Products for Process and Photomechanical Industries. Ilford Book of Formulæ.

Johnson & Sons.

Home Photography. 1, Developing. 2, Gaslight Printing. 3, Flashlight. 4, Bromide Printing. 5, Enlarging.

Kodak, Ltd.

" No more Dark Darkrooms." Four Grades of Kodak Film. Eastman Professional Films. Transferotype Paper. Kodak Printing Papers. Velox (Gaslight) Paper. Kodaline Reflex Printing. Kodaline Wet Stripping Film. Kodaline Film. Home Movies You Can Afford (Ciné-Kodak Eight). 16-mm. Ciné Kodak. Dental Radiography. Kodak Clinical Camera Outfit. Kodak Studio Outfits. The Kodak Unit System of Studio Lighting. Photo-Micrography (2s. 6d.)

How to make Good Pictures (1s.).

Real Orthochromatism (6d.).
The Photography of Coloured
Objects (2s. 6d.).

Wratten Light Filters (2s. 4d.). Elementary Photographic Chemistry (1s.).

The Fundamentals of Photography (5s.).

Kosmos Photographics, Ltd.
The Making of Prints on Vitegas.

Modern Traders, Ltd.

Picture Making with the Matelux.

Sashalite, Ltd.

Sashalite Photoflash Bulbs.

Soho, Ltd.

The Soho Reflex Camera.

Vanguard Co.

Varnishing Negatives Made Easy. Firelight Portraits by Daylight. Colouring Prints and Slides. Intensification and Reduction. Saving Over-printed Bromides.

Zeiss, Carl.

Zeiss Photo Lenses (On the Choice of a Lens).

Lenses and How They are Made. The Eagle Eye of Your Camera. The Tele-Tessar F/6·3.

Proxar and Distar Lenses.

Universal Tessar F/3·5.

Zeiss Biotessar F/2·8.

The New Tessar F/2·8 for Small Film Cameras.

New Extra Rapid Zeiss Photo Lenses.

Zeiss Yellow (Glass) Filters. Zeiss Photomicrographic

Apparatus.
Optical Equipment for Process
Work.

Zeiss Ikon, Ltd.

Connoisseur and Contax.
Accessories for Contax Photography.
The Contax Lenses.
The Contameter.
The Super Nettel.

Photographic Periodicals.

Agfa-Photoblatter, 65-67, Lohmuhlenstrasse, Berlin, S.O. 36.

Allgemeine Photographische Zeitung, Verlag, Jos. A. Detoni, Vienna VI., Mollardgasse 40.

Amateur Photographer and Cinematographer, Dorset House, Stamford Street, London, S.E. 1.

American Annual of Photography, 428, Newbury Street, Boston 17, Mass.

American Cinematographer, 1222, Guaranty Building, Hollywood, Cal., U.S.A.

American Photography, 428, Newbury Street, Boston 17, Mass., U.S.A.

Atelier, W. Knapp, Mühlweg, 19, Halle a/Saale, Germany.

Australasian Photo-Review, Kodak, (Australasia), Ltd., 379, George Street, Sydney, Australia.

British Journal of Photography, Henry Greenwood & Co., Ltd., 24, Wellington Street, Strand, London, W.C. 2. British Journal Photographic Almanac, Henry Greenwood & Co., Ltd., 24, Wellington Street, Strand, London, W.C.

Bulletin de l'Association Belge de, Photographie, 230, Avenue Albert Brussels.

Bulletin de la Société Française de Photographie, 51, Rue de Clichy, Paris, IX.

Bulletin de Photogrammetrie, 51 Rue de Clichy, Paris, IXe.

Bulletin of Photography, 636, Franklin Square (Cor. 7th and Race Streets), Philadelphia, U.S.A.

Camera, 636, Franklin Square (Cor, 7th and Race Street), Philadelphia, U.S.A.

Camera, C. J. Bucher, A.-G., Lucerne, Switzerland.

Camera, 2, Crow Street, Dublin.

Camera Craft, 413/415, Claus Spreckels Building, San Francisco, Cal., U.S.A.

Le Ciné Amateur, 94, Rue St. Lazare, Paris, IXe.

Civil Service Photographer, 38 Manor Road, Richmond, Surrey. Commercial Photographer, Abel's Publishing Co., 515, Caxton Building, Cleveland, Ohio, U.S.A.

Correo Fotografico, Maipu 231, Buenos Aires, Argentine Republic.

Corrière Fotografico, 6, Via Stampatori, Turin, Italy.

Film für Alle, Krausenstrasse 35/36, Berlin, S.W. 19.

Foto Revista, Alsina 974, Buenos Aires, Argentine Republic.

Fotographische Rundschau, 19, Mühlweg, Halle, a/S., Germany.

Fotokunst, Dambruggestraat 265, Antwerp.

Focus, Bloemendaal, Holland.

Fotograph Polski, Ul. Czackiego, 3/5, Warsaw.

Gallery (The), 27, Battenhall Road, Worcester.

Home Photographer, 8/11, Southampton Street, London, W.C. 2.

Home Movies and Home Talkies, 8/11, Southampton Street, London.

L'Instantané, 60, Rue Thomond, Paris V.
Jahrbuch für Photographie und
Reproduktionstechnik, W. Knapp
Halle a/S., Germany.

Kodak Magazine, Kodak, Ltd., Kingsway, London, W.C. 2.

Leica, Geibelstrasse 31, Hanover, Germany.

Lichtbild, Verlay Josef F. Limpler, Haida-Böhmen, Czechoslovakia.

Linse, Derfflingstrasse, 23, Berlin Lankwitz.

Miniature Camera, The, Fenwick G. Small, 1124, Myrtle Avenue, Brooklyn, N.Y., U.S.A.

Monthly Abstract Bulletin, Research Laboratory, Eastman Kodak Co., Rochester, N.Y., U.S.A.

Movie Makers, 105, West 40th Street, New York, U.S.A.

Nordisk Tidskrift för Fotografi, Stockholm.

Oesterr, Schmalfilmer, Neubaugasse 40, Vienna VII.

P.P.A. Record, Professional Photographers' Association, 49, Gordon Square, London, W.C. 1.

Photo-Art Monthly, Monadock Building, San Francisco, Cal., U.S.A.

Photo-Ciné-Graphie, 18 Rue Séguier, Paris, VIe.

Photo-Markt, Mariahilferstrasse 31, Vienna.

Photo-Miniature, 70, Fifth Avenue, New York, U.S.A. Photo Olzer, Prague.

Photo Pour Tous, 37, Rue Lafayette, Paris-Opera.

Photo-Revue, 118, Rue d'Assas, Paris VI.

Photo-Woche, Lindenstrasse, 26, Berlin.
Photofreund, 33, Stallschreibenstrasse,
Berlin, S. 14.

Photograph, L. Fernbach, Bunzlau.

Photographe, 189, Rue St. Jacques, Paris V.

Photographic Abstracts, Royal Photographic Society, 35, Russell Square, London, W.C. 1.

Photographic Dealer, Sicilian House, Southampton Row, London, W.C.

Photographic Journal, 35, Russell Square, London, W.C. 1.

Photographische Chronik, W. Knapp, Halle a/Saale, Germany.

Photographische Industrie, Krausenstr, 35/36, Berlin, S.W. 19, Germany.

Photographische Korrespondenz, Schottengasse 4, Vienna I., Austria.

Photographie für Alle, Krausenstrasse 35/36, Berlin, S.W. 19.

Polski Przeglad, Fotofraficzny, Kasi mierz Greger, ul 27, Grudnia 20, Poznan, Poland.

Procédé, 10, Boulevard de la Bastille, Paris, XIIe.

Process Engravers' Monthly, 12, Farringdon Avenue, London, E.C. 4. The Professional Photographer (for merly Abel's Photographic Weekly), 515,

merly Abel's Photographic Weekly), 515, Caxton Building, Cleveland, Ohio, U.S.A. Progresso Fotografico, Molins de Ray 9.

Apartado 678, Barcelona, Spain.

Revue de Photo (Phototidschrift) pour
Amateurs, Cyngel No. 2, Bruges

(Belgium).

Revue Française de Photographie,
189, Rue St. Jacques, Paris, V.

Science et Industries Photographiques, Revue d'Optique, 189, Rue de Savres, Paris, XVe.

Zeitschrift für Wissenschaftliche Photographie, J. A. Barth, 16, Dörrienstrasse, Leipzig, Germany.

While this list has been revised at the time of going to press (November 15th, 1935) it cannot be taken as either complete or entirely accurate regarding addresses. Postal authorities, however, will usually forward letters to the new address.

Permits to Photograph.

London Area.

Westminster Abbey.—From the Chapter Clerk, the Sanctuary, Westminster. Permission is rarely given. A fee of 5s. is required for each photograph.

St. Paul's Cathedral.—From the Dean's Verger. Fee, 2s. 6d. per day.

Tower of London.—From the Resident Governor.

Houses of Parliament.—From the Secretary, Lord Chamberlain's Office, House of Lords.

Guildhall.—From the City Surveyor, Guildhall, E.C. 2.

Picture Galleries (National Gallery, Tate Gallery).—Permission given only to professional photographers.

British Museum.—Special permission granted for use of stand cameras only by application in writing to the Director.

Victoria and Albert Museum.— From the Director and Secretary, South Kensington, S.W.7. There are special restrictions.

Zoological Gardens (Regent's Park and Whipsnade).—A fee of 2s. 6d. (on each occasion) is charged for permission to use a stand camera. Hand-cameras of any size may be used without permit. Ciné hand cameras for sub-standard film may be used by bona-fide amateurs without permit. A fee of £12 is charged for permission to take commercial ciné films. Application to the Secretary, Zoological Society, Regent's Park, London, N.W.

Royal Parks.—No permission required for use of hand cameras, provided that portraits or groups are not taken. For stand cameras, permission requires to be obtained from the Secretary, H.M. Office of Works, Storey's Gate, Westminster, S.W. 1. This applies to Hyde Park, Green Park, St. James's Park, Primrose Hill, Regent's Park, Greenwich Park, Richmond Park, Bushey Park and Hampton Court Park, Gardens and Green.

Other Parks.—Almost all other Parks in the London area are under the control of the L.C.C. Permits to use stand cameras on application to the Chief Officer, Parks Department, The County Hall, Westminster Bridge, S.E. 1.

Kew Gardens.—On payment of 3d. in addition to charge for admission.

Burnham Beeches.—From the Town Clerk, Guildhall, E.C. 2.

Epping Forest and Wanstead Park.—From the Town Clerk, Guildhall, E.C. 2.

Castles.—In most cases on application personally. At Raglan Castle the fee for amateurs is 1s., professionals 10s. Stokesay Castle: amateurs free, professionals £1 ls. In England and Scotland a great many historic buildings are in the charge of H.M. Office of Works.

Provinces.

Cathedrals.—Permission to use a camera in English Cathedrals is obtainable on application, in the great majority of cases, to the Dean. In some few instances no fee is charged.

Contractions.

The following is a list of the contracted descriptions most commonly occurring in photographic literature, catalogues of photographic requisites and advertisements in photographic journals. Especially to those in foreign countries it is thought that the meaning of these various contracted descriptions will be of service.

- B.—mark on exposure shutters, signifying "bulb," that is, setting of the shutter at which shutter remains open as long as the release is pressed.
- B. & W.—black and white. Used in description of photographs worked up (in black) with crayon, air-brush, or other method.
- B.P.—British Pharmacopæia. Indicates standard of strength and purity of chemicals.
- **G.**—Centigrade. Degree of temperature.
- **6.6.**—collodio-chloride printing paper.
- **c.c.**—cubic centimetre, metric measure of volume. 16.9 minims.
- C. de V.—carte de visite, an early size —about 3½ × 2½ inches—of portrait photograph.
- Cent.-Centigrade. See C. above.
- c.p.-candle power.
- **C.P.**—chemically pure. Trade description of chemicals.
- cryst.—crystallised. Indicates the crystalised form of any chemical as distinguished from the dry or anhydrous.
- D.—dauer. Marking on German shutters equivalent to B, which see.
- D. & E.—day and electric. Used in reference to portrait studios.
- **D.O.P.**—Developing-out paper. Term used in United States for gaslight papers.
- DIN.—Designation of plate speeds. The latest German system.
- D. & P.—developing and printing. The term is understood to mean the commercial quantity development of rollfilm and the making of prints from the resulting negatives. In United States the corresponding description is "Photo Finishing."

- F.—Fahr. or Farenheit. Degree of temperature.
- F.P.-focal-plane (shutter).
- F.P.A.—film-pack adapter. Frame for using a film-pack on a plate camera.
- H. & D.—Hurter and Driffield. Designation of speed of plates.
- I.—instantaneous. Marking on shutters indicating that at this setting the shutter gives one or other of the instantaneous (snapshot) exposures.
- M.—moment. Marking on German shutters equivalent to instantaneous.
- mm.—millimetre. 100 mm. equal 4 inches, very nearly—3.937 inches.
- M.Q.—metol-hydroquinone.
- offen. Marking on shutters of German make equivalent to B, which see.
- **P.C.**—postcard. In reference to cameras, plates and printing papers denotes a size of $3\frac{1}{2} \times 5\frac{1}{2}$ inches.
- **P.O.P.**—printing-out paper. Contraction first used (in Britain) for gelatino-chloride print-out paper.
- P.S .- plate sunk (mounts).
- q.s.—quant. suff. In formulæ, denotes that sufficient of the chemical is to be used to produce a particular effect.
- Scheiner.—Designation of plate speeds used in Germany.
- sp. gr.—specific gravity. Weight in comparison with an equal bulk of water.
- T.—time. Marking on shutters denoting that at this setting the shutter opens on pressing the release and remains open until the release is again pressed.
- U.S.—uniform system A system of diaphragm markings according to which f/4 is 1, f/5.6 is 2, f/8 is 4, and so on.
- **V.P.**—vest pocket. Size of camera. Generally understood to indicate a camera taking a picture 45×60 mm. in size = $1\frac{3}{4} \times 2\frac{3}{8}$ inches.
- W.A.—wide angle (lens).
- W.Y.W.—while-you-wait. Applied to portrait studios and also to cameras such as those used in beach photography for making ferrotype and similar portraits.
- Z.—zeit. Marking on shutters of German manufacture. It is equivalent to T, which see.



The ABC Index of Photography SEVENTY THIRD YEAR OF ISSUE

Post Free

SECTION I

Cameras and Lenses, with Maker's Special Fittings and Accessories.

SECTION II

Enlarging and Lantern Apparatus with Special Sundries for use with same.

SECTION III

Plates, Films and Papers, including all Sensitized Materials.

SECTION IV

Accessories and Sundries used in Photography.

SECTION V

Chemical and Proprietary Preparations used in Development and finishing Photographs.

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Acetylene Generators, Achromatic Magnifiers, Adaptors, Adhero Machine, Adhesive Tissues, Aerograph, Alarm Meters, Albums, Aluminium Stands, Antinuous Release, Anti-Splash, Jet, Aprons, Art Paper, Autochrome. Backgrounds, Balances, Ball and Socket Tops Ball and Tubes, Baths, Bellows, Binding, Binoculars, Blocks, Blotting Books, Blow-Through Jets, Bolting Silk, Books on Photography, Border Negatives, Bottles, Boxes for Bromide Chalks, Bromide Enlargements, Storing, Brooches, Brushes. Calculators, Calendar Bromoil, Mounts, Camel Hair Brushes, Cap for Lenses, Cases for Cameras, Carriers, Cassettes, Celluloid, Chalk Crayons, Changing Bags, Christmas Mounts, Circle Cutters, Circulator, Clarocit, Clips, Clocks, Cloth for Focusing, Cloud Negatives, Colour Screens, Colours, Condensers, Cover Glasses, Covers for Dishes, Crushers, Cutters, Cutting Shapes. Dark-Room Lamps, Dark-Room Pins, Dark Slides, Daylight Slides and Envelopes, Dead Black, Decimal Weights, Desensitizers, Desks for Retouching, Developing Tanks, Developing, Diamonds, Diagram Slides, Dish Brushes, Dishes, Distance Gauge, Dropping Bottles, Drying Rack, Dry Mounting, Dry Mounting Tissues, Drying Machine, Dusting Brushes. Earthenware Jugs, Electro-Cardiograph Registrations, Electric Lamps, Electric Heaters, Eliminator Hypo, Embossing Presses, Embossed Tissue, Enlarging, Envelopes, Exposure Fabric, Ferrotype Plates, Field Glasses, Film Packs, Film Albums, Filtering Paper, Finders, Firelight Stain, Finger Stalls, Finishing Pencils, Fixing Tool, Fixing Troughs, Flash Lamps, Flashed Opal, Flat Squeegees, Focuser, Focusing Cloths, Folders, Forceps, Funnels. Gardee Envelopes, Generators, Glass, Glazing Pads, Gloves, Gramme Weights. Heaters, Half-Watt Lamps, Hypo Dissolver, Hypon. Isochromatic Screens,. Japanese Colours, Jars for Chemicals, Jet Trays, Jugs. Kalko Paint, Knives. Lamps, Lantern Slide Making, Lead-Lined Sinks, Lead Tanks, Leather Cases, Lenses, Lens Cases, Lens Hoods, Levels, Light Filters, Light-tight Bags. Machines for Printing, Magnesium Lamps, Magnifiers for Focusing, Masks and Discs, Measures, Metal Tripods, Meters, Mortars and Pestles, Mountants, Mounts, Mount Cutters

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FALLOWFIELD'S ANNUAL

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Our Premises, in their central position overlooking Charing Cross to Trafalgar Square, are at the commencement of the noble thoroughfare leading to the Houses of Parliament. "Trafalgar Square" and "Strand" Stations on the Tube Railway are only a few minutes away, and either of the Charing Cross Stations (Southern and Underground) are reached in five minutes. Numerous omnibuses from all parts pass the door.



The Ground Floor, 3 Whitehall

Our Service. The name of Sinclair is synonymous with quality, and we are always ready to help and advise our friends concerning apparatus and materials of our own or other manufacturers. All goods advertised in this Almanac may be purchased from us.

Clients Abroad. Our large export trade has been built up by careful attention to Foreign orders. We realise that any error takes a long time to rectify, and every care is taken in testing

apparatus before shipment.

Developing and Printing Service. Our works at Brixton are in delightful surroundings, and we aim at the best work at the lowest possible price. The Sinclair Service in this department

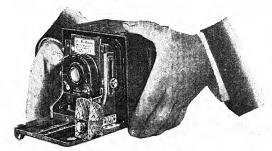
has always been recognised as the best.

Ophthalmic Department. We have a special department for eye-glasses and spectacle fitting, and stock all the latest aids to perfect vision. Oculists' prescriptions have every care and attention, for we realise that a perfect fitting frame is as important as the lens it contains.



NCLAIR"

IS UNRIVALLED FOR HAND OR STAND



Standard Model ith "UNA" Tilting Finder Scaled to Agree with the Rising Front of the Camera

For the Photographer who wishes to take pictures without distortion, to render buildings with vertical lines and distant objects in true perspective, the "Una" is unsurpassed.

Striking Comment of an officer of the MOUNT EVEREST EXPEDITION

He writes:

"During the Expedition I gave up using my own Camera, and used entirely one of your 'Una' Cameras we had with us, as I was so taken with the absence of unnecessary movements, and consequent rigidity of the instrument."

Some Press Comments

"Of the 'Una' Camera as an instrument of the best design and workmanship we have occasion to speak in the highest terms. Though it is equal to the widest range of work, it is an instrument of few movements and working parts." -The British Journal of Photography

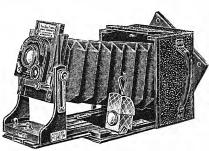
WHY THE "UNA" WINS WORLD-WIDE PRAISE Because of its workmanship. Our aim is to make a thoroughly good

- Because of its simplicity. We have introduced the movements required by the practical worker and omitted those that are rarely used and impair efficiency.
- Because of its design. We have given the greatest consideration to the points usually overlooked in camera construction. The design of the rising front, swing front and revolving back is such as to ensure the maximum rigidity when they are in use.
- 4. Because of its capacity. The "Una" is capable of doing everything. It can be fitted with any lens, any form of shutter and any style of plate or film-changing mechanism.



THE STANDARD "UNA"

ITS APPEARANCE. The Standard "Una" when closed appears as a compact box, covered with fine, hard-grain morocco leather. When the camera is opened and the front is extended, as in the illustration, the inner woodwork is seen to be of fine polished mahogany with brass fittings, all finished in the best possible style. The bellows is of leather, of long extension, and is particularly deep at the front to allow of a great range in rising front movement. It will be



The Standard "Una," showing front raised and tilted, and revolving back

noticed that when the camera is held in the hand ready for use, the level, finder, and focussing scale, are all on the left-hand side and in close proximity to one another—a small point but one of the utmost importance in actual work. Focussing is done by means of a rack and pinion focussing screw, with cross rack to prevent back-lash and this, together with the shutter release, is actuated by means of the right hand. feature that particularly impresses anyone who has not had experience with the "Una" Camera is the extraordinary rigidity of the front, and it is this that has made the "Una"

so popular amongst well-known experts in tele-photography, such as Captain Owen Wheeler and the late Dr. Atkin Swan. It was selected by the Royal Geographical Society for the Mount Everest Expedition. With modern anastigmat lenses the importance of a rigid front is frequently overlooked. In the Sinclair "Una" we have not sacrificed efficiency for the sake of an ounce or two in the weight.

The Sinclair "Una," instead of a detachable reversing back, has a revolving back that may be instantaneously changed from the upright to the horizontal position, even after the shutter of the dark slide is drawn and the plate is ready for use. On the revolving back is a deep hood, which may be quickly removed from the ground glass by pressing a couple of springs, should the hood not be required for any particular work.

The Sinclair "Una" front is solidly made, with a firm base which can be instantaneously clamped to the baseboard. We do not use any clips or springs to hold the front when the camera is brought out to the infinity mark, because in our opinion such spring clips, although perhaps very fairly effective when a camera is new, are likely to soon wear and they militate against the rigidity that is possible when the base of the front is tightly clamped to the base of the camera.

THE SINCLAIR RISING AND SWING FRONT: An important feature of the "Una" is the enormous range of Rising Front movement, and this rising front action is quite independent of the swing front. It will be found in practical work that the rising front is the first movement that the worker requires, particularly with modern anastigmat lenses. The extent of the rising front movement will be found on page 460. The Swing Front is an action more rarely required, and with the "Una" the swing front action is a central swing, and the importance of a central swing will be greatly appreciated by all expert photographers. It permits of the foreground being rendered perfectly sharp at the same time as the more distant objects when using a large aperture lens.

John Russel Pope, Esq., writing from New York, U.S.A., says: "The 5 × 4 'Una'is equal to anything. I am delighted with it, for it is simple and fool-proof."



THE "UNA" EXTENDING BASEBOARD. The Standard "Una" has Double Extension, and this is sufficient to allow objects to be copied the same size with the lens usually fitted. A Triple Extension pattern is also made.

THE FOCUSSING SCALES. These are of real ivory and divided into yards, not into an odd number of feet, which are exceedingly difficult to judge. In practice, yards correspond with strides, and will be found very easy to estimate.

A "DEPTH OF FOCUS SCALE," indicating the depth of focus obtained with various stops, is also fitted.



The Revolving Back of the Sinclair "Una."

THE SINCLAIR
"UNA" REVOLVING BACK. This very
important improvement
permits the plate or film
being changed from the
vertical to the horizontal
position without removing the back of the camera, which revolves on a
light-tight turntable.

The "UNA" DOUBLE PLATE HOLDERS.
The "Una" plate Holders differ materially from other plate holders apparently similar in design and we have no hesitation in stating that for all but colour work they are far superior to the best book-form slides. For colour plates we supply specially designed book-form slides fitted with improved light-tight valves and draw-out shut-

ters. The features of the "Una" Slide are :-

- The quality of the pull-out shutters, which are of the finest hard rubber. It is very rarely these shutters break, and they can be recommended for tropical use.
- The valves in the plate holders where the shutters enter are made with the greatest care and ensure a more light-tight fitting than is possible with book-form slides.
- 3. Each place holder is fitted with Auto-Safety Catches to obviate double exposure.

THE LEVELS. All cameras are fitted with Levels, the position selected being near the finder and focussing scale.

THE GROUND GLASS SCREEN is covered with a Focussing Hood, so arranged that it can be removed in a moment should a focussing cloth or focussing magnifier be preferred.

THE FINDER. An important part of the "Una" Outfit is the Sinclair Tiling Finder. With most hand cameras the finder is quite worthless when the rising front is in action, and without the rising front it is impossible satisfactorily to photograph subjects in which buildings appear. Our contention is that as good work should be done in the hand as can be done on a tripod, and this is only possible with such a finder as ours. When taking a picture the camera is held level as judged by the spirit level, the finder is then tilted to get the view desired, after which the scale on the rising front is adjusted to agree with the scale on the finder. The exposure is then made.

J. A. Smith, Esq., of the Sarawak Government Offices, writes —" The best little camera I have ever had."



LENSES. The best camera needs the best lens, and the best lens is of little value without a perfect camera. We use those lenses whose worth have been proved.

SHUTTERS. On the smaller size camerts we use the "N.S." Perfect Shutter (see page 466). The "N.S." Shutter has not the aggravating jump in speed which is such a feature of most diaphragmatic shutters, but is at present only made in small sizes.

TROPICAL STANDARD "UNA"

THE TROPICAL STANDARD "UNA" is exactly the same design as the regular pattern, but it is made of selected mahogany, brass screwed or bound, and polished on the outside instead of being leather covered. We do not make our cameras in teak, because our experience is that teak is quite unsuited for hot and dry climates.

DETAILS OF STANDARD MODELS

| | Size closed without hood | Exten- sion | Weight with screen but without hood | Extent of rising front | Thickness of hood | Weight of hood |
|---|---|--|--|------------------------|-------------------------|---|
| 3½ × 2½ in., o 9 × 6½ cm. 4½ × 3½ in. 5 × 4 ,, 5½ × 3½ ,, 10 × 15 cm. 6½ × 4½ in. | 1 4 4 × 3 1 × 5 5 5 4 × 4 1 × 7 5 6 1 × 7 7 8 × 4 1 × 7 5 8 × 4 1 × 8 1 | 9½ in. 118 ,, 124 ,, 134 ,, 154 ,, | 1 lb. 10 oz. 2 ,, 6 ,, 2 ,, 15 ,, 3 ,, 12 ,, 4 ,, 2 ,, 4 ,, 8 ,, | 1 in. 2 in. 2 in. 3 | in. | 1 ½ OZ. 2 ½ 55 3 55 3 2 55 4 55 |
| 7×5 in. or 18×13 cm. | 8§×5 ×9 | 17 " | 4 ,, 12 ,, | 4 ,, | ŀ., | 41 , |

The "UNA" for High-Power



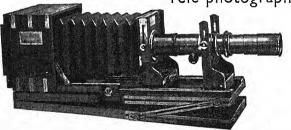


Illustration of Standard Tropical Model "Una" Camera, supplied to H.M. Government, complete with Atkin-Swan Tilting Table and Telephoto Lens.

Otho Webb, Esq., of Queensland, Australia, writes:—"The Everest 'Una' is a beauty—it is so perfectly built. Everyone has fallen in love with it."



PRICES

STANDARD MODEL "UNA" CAMERA, with "Una" Tilting Finder scaled to agree with rising front on camera, Level, Focussing and Depth of Focus Scales. Three Double Plate Holders, "N.S." Perfect or other suitable diaphragmatic Shutter and fitted with lenses as follows:—

| Lenses | 3½×2½ and 9×6½cm. | | | ‡-plate | | | 5 × 4 or 9×12cm. | | | 10 × 15 cm. or 5½×3½ | | | <u>1</u> - | pla | te | 7 × 5 and 13 × 18cm. | | | |
|-------------------------------------|-------------------------|----|----|---------|----|----|------------------------|----|----|----------------------------|----|----|------------|-----|----|----------------------------|----|----|--|
| Ross Homo- | £ | s. | đ. | £ | s. | đ. | £ | s. | d. | £ | s. | d. | £ | s. | d. | £ | s. | d. | |
| centric F/6.8 | 21 | 10 | 0 | 23 | 0 | C | 26 | 10 | 0 | 27 | 0 | 0 | 32 | 10 | 0 | 36 | 10 | 0 | |
| Ross Xpres, F/4.5 *Ross Comb- | | 10 | 0 | 26 | 10 | 0 | 29 | 0 | 0 | 32 | 0 | 0 | 36 | 10 | 0 | 41 | 10 | 0 | |
| inable, 2 foci F/5.5&F/11 | 28 | 0 | 0 | 31 | 10 | 0 | 34 | 10 | 0 | 37 | 10 | 0 | 42 | 0 | 0 | 46 | 10 | 0 | |

^{*} These prices include Cameras with Triple Extension.

TROPICAL MODELS. Extra on above prices.
£3 10 0 £3 10 0 £4 0 0 £4 0 0 £4 0 0 £4 0 0

Triple Extension on Standard and Tropical Models, £2 0 0 extra on all sizes

ACCESSORIES FOR "UNA" CAMERAS

| | 3½×2½ and ½-plate | | | - | × and | Ľ | 10 × 15 cm. and 5½×3½ | | | | | | 7 × 5 and 13 × 18 cm | | |
|--|-------------------------|----------------|-------------|---------|-------------------|------------------|-----------------------------|----------------------|--------------|-----------------------|------|------------------|----------------------------|-----------------------|---------|
| Extra Double Plate Holders each Extra Tropical Spanish Mahogany Plate Holders each Special Book-form Plate Holders, suitable forAutochrome, Agfa, or ordinary Plates Ditto, Tropical Model Leather covered Film Pack Adapter each Ditto, Tropical Model Hand-sewn Leather Case, with lock and key, to hold Camera and three Slides Ditto, for Camera and six | 1 2 2 2 3 | 2 | 6 6 0 0 0 0 | 2 2 3 3 | | 0 0 6 6 | 1 2 2 2 | 11 16 10 15 | | 1 2 2 3 4 | 15 0 | 6 6 0 0 | 2 2 3 3 4 | 2 7 0 5 0 | 6 0 6 0 |
| Slides | 0 | 15 10 15 | 6 | 0 | 10 5 × 5 16 | 6 4 0 | 0 | 1 × 5 | 6 31 0 | 1 | 10 | - | 6 0 6 7 | 10 | 6 |

Atkin-Swan Tilting Table, for use with high power Telephoto Lenses Price, for all sizes (illustrated on page 460) £7 10



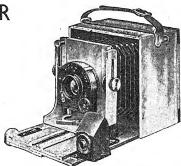
The SINCLAIR

"TRAVELLER UNA"

is a

Metal Camera of
the Highest Class.

3½ × 2½ (9 × 6½ cm.)
with
Ross Combinable
Lens (2 foci)
and "N.S."
Perfect Shutter.



The "Traveller Una" with normal extension as used with the combined lens.

"A joy to look upon, and stands in a class by itself ready for work in any habitable (or practically uninhabitable) part of the globe."—Photographic Journal.

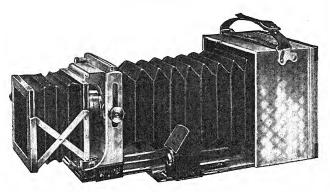
The "TRAVELLER UNA" is built on the same lines as our Standard and Tropical Models, and is particularly suited for Explorers and Scientists who require an instrument to stand the roughest wear and tear. It is made of Duralumin—a metal nearly as light as aluminium but without any of its drawbacks, and is very beautifully finished. It is as well adapted for hand as for stand use, and the lens fitted is perhaps the most generally useful lens made for the practical worker, because not only is it very rapid (F/5.5) but the single elements working at F/II give a very practical telephoto effect when photographing distant objects such as mountains, etc.

In this camera we have not hesitated to add a little extra weight, so that perfect rigidity is secured when fully extended, either when copying objects the same size or if used for telephoto work. The camera is fitted with two scales, one for the combined lens working at F/5.5, and the other for the single lens working at F/II. It has a tilting finder marked down to show the view given by the combined and single lens. This finder is scaled to show the amount of foreground cut off when the rising front of the camera is in use, and a level is also fitted.



The SINCLAIR "TRAVELLER UNA"

(continued)



The "Traveller Una" with double extension and with Sinclair Lens Hood on front.

The shutter is the "N.S." PERFECT Shutter, giving the speeds required by the practical worker, viz.: from ½-second to I/100th second, as well as "Time" exposures.

The "TRAVELLER UNA" with its shutter and optical equipment is only sold as a complete unit, and it cannot be supplied without lens or shutter, although other supplementary and Telephoto Lenses can be added to the outfit when desired.

The "TRAVELLER UNA" measures $4\frac{5}{8} \times 3\frac{1}{8} \times 4\frac{5}{8}$ in. (11.7 \times 8 \times 11.7 cm.). The extension is 10 in. (25 cm.) and the weight, including lens and shutter, is 3 lb. (1.36 kilos.).

The Price of the Outfit complete, including Lens and Shutter as described, and three Tropical Model "UNA" Plate Holders

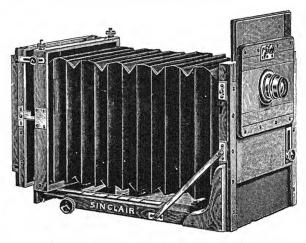
Extra for Sinclair Lens Hood as illustrated, 25/-

Film Pack Adapters and other Accessories can be fitted as listed on page 461.



THE SINCLAIR "TECHNICAL" CAMERA

As supplied to The War Department, His Majesty's Indian Government, The New South Wales Government; The Crown Agents for the Colonies; Southern Rhodesia; The Siamese Government; The Egyptian Government; Engineering Works and Scientific Institutions.



This Camera in its general character is of the square bellows long-focus type but has a number of improvements in design, making it the most efficient of its class and particularly suitable for Professional, Technical and Scientific work. It is made of the best seasoned Spanish Mahogany, and great care is taken to ensure parallelism between front and back, an important matter with modern anastigmat lenses.

THE RISING AND FALLING FRONT. As will be seen from the illustration there is a very great rising front movement, and there is an equally great falling movement. This is attained by means of a moving panel at the back of the rising front, and which may be adjusted so that either a great rise or a great fall is secured.

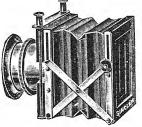
THE SWING BACK. A central swing is provided, and the arms are as long as possible, so that the greatest range of movement may be obtained. By means of the clamping screws on the top of the camera a side swing can also be obtained for special work.

61 $\times 43$ 83 $\times 61$ /12 \times 10 15 \times 12

| Camera and 3 Double Dark Slides | £ 24 | s. 0 | d. 0 | £ 30 | s. 0 | d. 0∮ | 40 | s. 0 | i. | £ 50 | s. 0 | i. |
|---------------------------------|---------|---------|---------|---------|------|----------|----|------|----|---------|------|----|
| Ditto, Brass Bound | 27 | 10 | 9 | 34 | 0 | 0 | 45 | 10 | 0 | 56 | 10 | 0 |
| Extra Double Slides each | 2 | 10 | 0 | 2 | 15 | 0 | 4 | 10 | 0 | 6 | 0 | 0 |
| Extra Brass Bound Double Slides | | | | | | | | | | | | |
| each | . 3 | n | a | 2 | 5 | n | 5 | E | n | 4 | 17 | 4 |



THE "SINCLAIR" ADJUSTABLE LENS HOOD AND SCREEN HOLDER







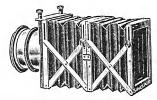
Closed

PREVENTS FOGGY NEGATIVES A Typical Testimonial.

Sheffield.

Lens Hood to hand. It is a beautiful piece of workmanship and very efficient. I have already used it with great success.

W. F. A.



"The practical photographer will be wise in regarding this accessory as an indispensable part of his equipment."

British Journal of Photo-graphy.

Hood with Extension for Tele-photography.

No one who has once used the bellows hood of this form is likely to expose another plate without it. It enormously increases the brilliancy of the result and permits of photographs being taken against the sun which would otherwise be impossible. The Sinclair Lens Hood is not only adjustable as regards the extension, but also in its range for fitting to the hoods of lenses, and consequently the same lens hood will fit a large number of lenses, and the vice grip permits of it being securely held in position. Each hood is also fitted with a spring screen holder, permitting screens to be instantly changed or removed. The same screen will therefore suffice for any lenses which the hood will fit, and the necessity for special caps or screw-in cells is obviated. In cases where lenses are fitted to shutters or are in sunk mounts, a small metal hood to screw into the front cell of the lens may be necessary, which we, or any maker or dealer, would supply.

Price XI or X2 Adjustable to fit Hood of Lenses Extension Size closed Size Screen to fit up to from 8/-10/-2§ in. 25/to 1½ in. 3 ×2⅓×1 No. 00 ... 31×3×11 41×31×11 30/-2½ in. No. I 11 to 2 in. 12/9 2 to 21 in. 3 in. No. 2 21 to 3 in. in. No. 3 Opening 51×7 × 11 60/-Large Hood 5 × 4 in. 51 in.

For Studio and Kine' Cameras.

Collapsible Extensions may be had for Nos. 1 and 2, and these increase the lengths when open to $4\frac{3}{4}$ and 6 inches respectively. Such extensions cost for No. 1, 20/- and No. 2, 25/-. They are very advisable for Tele-photography.



THE



SHUTTER

NO VARIATION GREAT EFFICIENCY SMOOTH IN ACTION

The "N.S." Shutter gives the speeds most useful to the practical photographer and those that work conveniently with the lens apertures, viz., ½, ¼, ½, 1/32, 1/64 and 1/100th second.



Iris Aperture
No. o Size ... 7/8 in.
No. 1 Size ... 1 in.

Tube Diameter for Lenses Price 1-1/16 in. 1-3/8 in. Price 4 0 4 0

No. 1 Size... ... 1 in. I-3/8 in. 4 0 0 When Lenses are ordered from us fitted to this Shutter there is no extra charge for fitting. The charges for fitting customers' own lenses range from 17/6 to 30/-

THE "SINCLAIR" FOLDING COPPER LAMP



This is a thoroughly well made lamp, constructed of copper in such a way that it will take safelights $8\frac{1}{2} \times 6\frac{1}{2}$ in., and arranged with "bayonet" or "screw" adapter for attachment to electric light fittings. Where there is no electricity, the aperture which takes the electric light fitting is closed by a screw cap, and either "Sinclair Devolights" or Fairy Night lights may be used for illumination. Folding flat and being non-rustable it will be welcomed by travellers.

Price, complete with 6 ft. of flexible wire and lampholder, together with one 8½×6½ in. Wratten Safelight of any grade, is...

Extra Adapter so that the Lamp can be used with either "bayoner" or "screw" fitting...

Extra Safelights... each

5/6 5/6

35/-

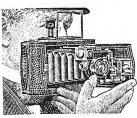
Tropical "Devolights" for use with this Lamp, if electricity is not available per doz. 2/6
When ordering, state whether Lamp is required with "bayonet" or "screw" fitting.

SINCLAIR LONDON

THE SINCLAIR FRAME FINDER AND VIEW METER

Saves Plates, Films and Disappointment

The unreliability of many camera finders has led to our designing a simple form of frame finder, which is valued by the practical photographer.



THE SINCLAIR FRAME FINDER can be kept on or removed from the camera as desired.

THE SINCLAIR FRAME FINDER is collapsible and goes into a very small space.

space.

THE SINCLAIR FRAME FINDER can
be accurately adjusted to show the picture taken by any camera with a large
range of lenses.

THE SINCLAIR FRAME FINDER is

HE SINCLAIR FRAME FINDER is equally suitable for the professional with a large stand camera, as for the amateur with a Vest Pocket Kodak. THE SINCLAIR FRAME FINDER per-

mits of the camera being used at the eye level—the natural position.

THE SINCLAIR FRAME FINDER consists of a collapsible frame made of brass, attached to a base in the form of a lazy tongs that has at the other end a folding sighting plate. When closed, it measures 3 in. \times $1\frac{3}{2}$ in. \times $\frac{1}{2}$ in. and weighs only 2 oz.

The finder is designed to slide into a variety of fittings that are made for all types of camera. When not in use, the folded finder can be kept on the camera or, if more convenient, carried in the waistcoat pocket.



No.



No. 2



M. 3

THE SINCLAIR FRAME FINDERS are made in two types and each type can be had with 3 kinds of fitting.

Type I. For plates and films of the normal proportions, such as \(\frac{1}{4}\)-plate, \(5 \times 4\) in., \(\frac{1}{2}\)-plate, etc.

I films of the ch as 1-plate, such as given by the V.P.K., No. 1A and 2C Kodaks and postcard size.

The fittings are as follows:

No. 1. Standard fitting, for cameras with wooden bodies to which the fitting can be screwed, and into which the Finder fits.

No. 2. Spring fitting, for attachment to metal cameras such as Folding Brownies, Carbines, Ensigns and V.P.K. Models B and III.

No. 3. Special fitting for use on the original Vest Pocket Kodak, no screwing being necessary.

Pric

Either type of Finder with one fitting of either number 6/Extra fittings Nos. 1 and 3 ... each 9d. Extra spring fittings No. 2 each 1/6

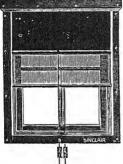


THE SINCLAIR DARK ROOM BLINDS

AT ONCE CONVERT ANY ROOM INTO A DARK ROOM

"One of the things which we all at times make, or get made for ourselves, usually in a rather unsatisfactory way, has been

done very well indeed by Mr. J. A. Sinclair's firm."—British Journal of Photography.



This consists of a well-made varnished wood frame with two grooves, in which red and black blinds travel, and when both are down no trace of white light is admitted. We make the fitting to any measurements, and we shall be pleased to give quotations on application. Screws are supplied with the blind, and all that is necessary is to screw it to the window frame.

Specimen Size and Price:

Size about 5 ft. ×4 ft. £9 0 0 0 ..., 7 ft. ×4 ft. 10 0 0 Quotations given for any size,

DARK ROOM RADIANT TIMER

Panchromatic and Colour Plate workers in particular will appre-



ciate this new kind of luminous watch. The large figures on the outer edge indicate the seconds, and on the inner scale from 0 to 10 indicating minutes, as well as points for each second, are made of a very radio-active compound which shows clearly in the dark. A pressure of the knob at top starts the two luminous hands from zero, a second pressure stops them, and a further pressure returns them to zero again. The luminosity is greatly intensified if the Timer is held near an electric light bulb before commencing work.

Price ... £3 12 6



THE "SINCLAIR" HIGH POWER FOCUSSING MAGNIFIER X.4

Will be appreciated by those doing copying work or in subjects where very critical focussing is essential. Glasses with great magnifying power are usually so short that it is difficult to get the head sufficiently close to the ground glass focussing screen. In the case of the "Sinclair" Magnifier the tube is 6½ in. long, and the end which is placed into contact with the ground glass is sufficiently large to keep the glass steady when moving it over the surface. It reverses the image, and consequently the picture on the screen is seen the right way up.



It is sold in a leather covered carrying case measuring 62 x 12 in., and the weight, complete with case, is 61 oz. Price, in case complete ...

THE "SINCLAIR" MAP READER

This Reader consists of a solid block of glass, which stands on the map, photograph, postage stamp or other article which it may be desired to examine. No special focussing is necessary, and motorists can exam-ine details of their maps without stopping their cars. Curio collectors will appreciate the ease with which they can examine details of the signature, etc.

The Reader is sold in a leather covered case, measuring 13 × 13 in. (45 × 45 mm.) and the weight is 4½ ozs.

Price, in case complete



PEN MICROSCOPE

These Microscopes have the great advantage that they possess high power in a small space and are wonderfully convenient to use. The No. 1 pattern is like a fountain pen in appearance and magnifies 25 times. The No. 2 pattern as illustrated is rather larger in size and is fitted with achromatic lenses giving a larger



field and magnification 40 to 60 times. The end of the microscope is placed on the surface to be magnified, and a sliding stud enables sharp focus to be secured. They are invaluable for examining signatures, botanical specimens and any fine detail.

25 times 40 to 60 times ... 4/6 each No. 1.

with pocket case, 20/-No. 2. with pocket case, 22/6 20/-Ditto, Screw focussing No. 2A.

40 to 120 times, with stand 65/-No. 3.

SINCLAIR BROMOIL REQUISITES

| BOOKS.—All photographic handbooks are supplied. "Bromoil and Transfer," by L. G. Gabriel | 7/6 |
|---|--------|
| "Pigment Printing." The Bromoil Process from the | - 1 - |
| negative to the transfer. 37 Photogravure illustra- tions and numerous half-tones, by G. L. Hawkins, | |
| M.C., F.R.P.S. | 10/6 |
| "The Art of Pigmenting," by Bertram Cox and F. C. | 1/- |
| Tilney "Expression in Pigmenting," by F. C. Tilney | i/- |
| "Perfection in the Pigment Processes," by Chris. J. | • /- |
| • | 1/- |
| "How to Make a Bromoil Print," concise instruction | ns by |
| James A. Sinclair, F.R.P.S Post free on applic | ation. |



SINCLAIR TRIAL OUTFITS

Containing the essential requisites for beginners with Bromoil.

> Boxed complete. Price, 10/6 Postage in U.K., 6d. extra.

> > 6d.

PAPERS FOR THE BROMOIL PROCESS Double Weight: White, Smooth or Rough: and Cream, Smooth or Rough.

10×8 12 X 10 61×42 $8\frac{1}{2} \times 6\frac{1}{2}$ 15×12 7 pieces 6 pieces ... 1/6 4/11 per doz. 9/6 1/3 12 pieces ... 3/-ACCESS ORIES. Slabs—for pigmenting, 10 × 8, 2/-; 12 × 10, 3/-; 15 × 12 "Clairo"—a non-inflammable fluid for cleaning oil pigment brushes— 4/6 per bottle, 1/6 and 2/6 Pigmenting Palettes—plate glass, ground surface and edges. This is the best palette Palette Knives 3/-... 2/-Blotting Boards—special thick, fluffless, 25 × 20, 5d. per sheet; per doz. Retouching Lancets—for removing defects or scraping up lights in prints 4/-2/-(see page 474) per box Oil Stumps—for retouching and putting lights in wet prints, per doz. No. 1 5d.

3/-Wetal Clips—for hanging up prints to dry... ... per doz.

Varnish for Oil Prints ... per bottle

Plastic Rubber—This may be moulded to any shape and is most useful 2/3 2/3 for working on wet prints per piece SINCLAIR FINISHING RUBBER—For strengthening lights on any 4d. prints. Almost magical in its effect Ad. per piece



SINCLAIR'S IMPROVED BROMOIL PIGMENTS ARE THE EASIEST TO USE



BLACK BROWN BROWN BLACK WARM SEPIA BURNT UMBER COBALT BLUE ULTRAMARINE INDIGO

BURNT SIENNA ZINC WHITE VERIDIAN GREEN **FOLIAGE GREEN** CADMIUM YELLOW LIGHT YELLOW RED CHALK VERMILION CRIMSON LAKE ENCRE MACHINE. A hard warm black ink. ENCRE TAILLE DOUCE. A soft ink to mix with Encre Machine.

These two last are the inks used by Messrs. Demachy, Puyo, Read, etc.

All above colours, 1/3 per tube. Special Colours for Three-Colour Work, 2/6 per Tube.

MEDIUMS for thinning the Colours. The Roberson Medium—For quick drying.
6d. per Tube.

The Sinclair Bromoil Medium—A slow drying medium especially useful in the Transfer Process. 2/3 per large tube.



THE SINCLAIR BROMOIL BLEACHER

Needs no Acid Bath and makes Pigmenting a pleasure.

The Sinclair Bleacher is made from our improved formula, which enables a Bromoil to be made from a more delicate print than is usual with work of the published recipes.

> It is used by many leading experts. 10 oz. concentrated solution ... 2/-Post Free in U.K., 2/6

SINCLAIR BROMOIL BRUSHES

Genuine Pole-cat Fitch Brushes.—These are undoubtedly the best brushes for Oil and Bromoil work and will last for years if carefully used.

No. 1, 1/6 *No. 5, 2/6 No. 12, 7/6 No. 18, 16/-No. 2, 1/7 *No. 8, 4/6 No. 14, 9/6 No. 20, 22/6 *No. 3, 1/10 *No. 10, 6/- No. 16, 12/6 No. 24, 31/6 No. 28, ... 50/-

Small size for detail work, B, 8d.; C, 9d.; D, 10d. each.

* Nos. 3, 5, 8 and 10 are also supplied "straight cut" instead of bevel shape, and are for use with a "Hopper."

"B" Series Bromoil Brushes.—These Brushes were introduced by us when pole-cat hair was practically unobtainable and are of excellent quality but have less resiliency.

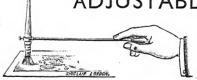
No. 0, 1/- *No. 5, 1/6 No. 14, 3/6 No. 24, 9/-No. 2, 1/3 *No. 8, 2/- No. 18, 6/- No. 28, 10/6

"Mortimer" Brush.—This Brush is made of long and fine hog hair, shaped like our Fitch Brushes, and will be appreciated by those who desire broad effects. It is used by the Editor of the "Amateur Photographer."

No. 1, \(\frac{3}{2} \) in. \quad \quad \quad \quad No. 3, 1\(\frac{1}{2} \) in. \quad \



SINCLAIR ADJUSTABLE HOPPER



A valuable adjunct for increasing contrast over small areas and for working clouds into the sky.

Price, 2/6 each.



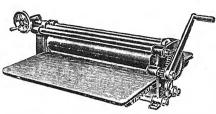
A NON-FLAM CLEANING FLUID

For Cleaning Oil Pigment Brushes, Invaluable for Cleaning and Restoring Cine Films, and the Best Cleanser and Cleaner for the Home. Cleans without injuring Silks, Satins, Woollens, Linens, Kid Gloves and Shoes, Gramophone Records or Typewriters.

Bottles, 176 and 2/6 each.



BROMOIL TRANSFER PRESS



The beauty of the transfer process appeals to everyone. By its means is obtained a peculiar quality very similar to that of photogravure. This Press is specially designed for the process, its features being :-

Perfect alignment of rollers, eliminating the need of a blanket, and ensuring a clear cut impression without creep.

Simple and effective pressure loading device, giving the finest adjustments by the single motion of the hand wheel.

Ease and evenness of operation through the reduction gearing of ratio 3 to 1, giving easy turning with one hand.

Dimensions: Roller Diameters 31 inches. Effective Width of Rollers 20 inches. Table 23 × 23 inches. Approximate Weight 100 lbs. £11 15 0

Price, inclusive of Zinc Sheets

THE "REVELLE" **BROMOIL TRANSFER** DESK



This Desk was designed by Mr. A. Hamilton Revelle, a very clever and artistic worker, and it is particularly adapted for those who work in the smaller sizes, say up to 8½ by 6½ in., or who wish for further power of control when transferring.

It consists of a drawing board 16 in. by 11½ in. in which is framed a piece of plate glass. Two zinc squares are adjustable to hold the reversed Bromoil print, and these, as well as the transfer paper, are firmly held in position by a clamping board at one end of the desk.

The transfer is made by pressing a "tool" on the back of the transfer paper. With this desk re-inking is unnecessary. The progress of the print can be repeatedly examined, and continued action of the "tool" on the back of it will gradually increase the strength in that part. It is evident that this desk affords scope for much selective treatment in pictorial work. Price, 25/-

Transfer Tools, 3/- each. Postage and Packing in the U.K. 9d.



THE



UNIPOD

Invaluable for users of clockwork driven Kiné Cameras and greatly appreciated by hand-camera workers who wish to give the slower exposures satisfactorily.

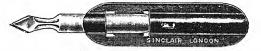
It is impossible to do justice to this well-designed Unipod in our illustration. In appearance it is like a walking-stick when closed, beautifully finished with black enamel, and is 37½ inches long. It extends to 68 inches and is absolutely rigid. It is constructed of drawn steel tube, and the inner section is nickel-plated with dull finish as a protection against rust. The black wooden knob is removed for use, and it can be supplied with ¼-inch Whitworth or Continental screw thread. When a camera is on this Unipod it can easily be held rigidly for exposures of ½, ½ and ½ second.

Weight, 11 lb.

Price . . 35/-

Adapter, so that Unipod can be used with both \(\frac{1}{4}\) Whitworth and Continental thread \(\therefore\) \(\tau_6\) Leather Sling Handle \(\therefore\) \(\therefore\) | 1/9

THE PEN PRINT TRIMMER and RETOUCHING LANCET



This admirable little instrument should be kept in every photographer's pocket, or on the workroom table. For trimming prints, scraping out defects, or inserting a high light it is the best tool available, and being made of the finest steel it can be sharpened to a keen edge.

Nickel Boxes containing 20 Lancets
Price, including Holder ... per box 2/-





THE "SINCLAIR" RANGE FINDER

IS THE PERFECT ONE-MAN INSTRUMENT

Some advantages and uses of the "Sinclair" Range Finder

MILITARY

It can be used for taking ranges and dimensions of any distant object with great exactness by one man. It registers the ratio of distance to base, and makes the base at the point observed.

It will measure the distance of an object without the observer having to move in a lateral position. It may be used as a Depression Range Finder, without the

necessity for a pedestal or levelling.

It can be used during attack, when, owing to enemy's fire, only a momentary observation is possible and will give the range without the necessity for leaving cover.

NAVAL

It may be used as a Range Finder from a fighting top. It may be used from sea level when attacking permanent land fortifications.

It is the best instrument for Station Keeping and Coast Navi-

gation. It is unrivalled for rapid sextant work when it is advantageous to avoid the delay of consulting mathematical tables.

SURVEYING

It is the best instrument for Rapid and Accurate Survey Work, used in conjunction with a Plane Table.

The "Sinclair" Range Finder does not need a definite Base, Mathematical Tables or Difficult Calculation.

Weight in case complete, 2 lb.

Price, including leather sling case £7 10 0

Send for Descriptive Booklet.



WESTOCK MOVING PICTURE CAMERAS AND PROJECTORS

FOR AMATEUR AND PROFESSIONAL USE

AGFA
BELL & HOWELL
BOLEX

BOLEX DE VRY ENSIGN NEWMAN-SINCLAIR PATHE SIEMENS & HALSKE VICTOR

KODAK

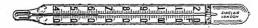
ZEISS

MINIATURE CAMERAS OF ALL THE LEADING MAKES

We hold a full stock of Leica Cameras and Accessories and specialise in Developing, Printing and making Lantern Slides from Leica films.

THE "SINCLAIR" LEGIBLE THERMOMETER

This Thermometer will be found of great value when working with red and green safe lights, the scale being a very open one, and the figures of a large size.



The former has a range of from 40° to 120° F. and the scale is of opal contained in a glass tube and consequently unaffected by chemicals. The mercury tube has a magnifying lens front. The thermometer is sent out in a cardboard case and is $8\frac{1}{2}$ in. long.

Price .. 6/6





AUTO KINE' CAMERAS

(Newman and Sinclair's Patents)

REGULAR, STUDIO and SLOW MOTION MODELS



Mr. Robert J. Flaherty filming "Man of Aran" with the "N.S."
Auto Kine' Camera.—by courtesy of the Gaumont-British Picture
Corporation Ltd.

THE MOST MARVELLOUS CLOCKWORK-DRIVEN CAMERAS IN THE WORLD.

Amongst notable users may be mentioned :-

H.M. Admiralty.

H.M. Air Board.

H.M. Post Office.

The Empire Marketing Board.

The London County Council.

SINCLAIR LONDON

THE "N.S." AUTO KINE' CAMERA-Regular Model-cont.

The "N.S." Auto Kine' Camera is the only instrument driving nearly 200 ft. 35 mm. film with one winding and at a practically constant speed throughout the run within a variation of only 4 per cent. The speed can be varied from 10 to 24 frames per second. The starting and stopping are instantaneous, and no film is wasted in getting up speed. No tripod is necessary when using normal

focus lenses, and the camera can be used as easily as a hand camera.

The addition of a Unipod relieves the operator from supporting the weight of the camera and does not detract from its portability or the facility with which it can be directed and operated. With the "N.S." Auto Kine Camera one may photograph from the ground level or from the top of a ladder, in a crowded sports ground, or from an aeroplane. It may be pointed directly upward or directly down, or the camera can be inverted for taking reverse action pictures. Separate film reservoirs are used, and a new film can be placed in the camera in 10 seconds. Almost any focus lens can be fitted, and the method of changing lenses is simple

and expeditious. Each lens in its mount carries its own focussing scale.

ITS CON-STRUCTION

THE FILM BOX

SPECIFICATION.
The "N.S." Auto Kine' Camera is made entirely of metal,
Duralumin being used. The box-like shape makes it a
very convenient instrument to handle and carry.

This box is made of Duralumin. It is rectangular in form, without projecting mechanism. It holds 200 ft. of film, and into the same box the film is automatically wound after exposure. At any time the box can be removed from the camera in

daylight and another box of film inserted in its place in from 10 to 15 seconds. THE FINDER The Finder is self-contained, and is viewed by looking through the instrument. It shows a brilliant image the right way up and the right way round. The spirit level and the film AND LEVEL

measuring index are seen clearly in the lower part of the finder so that the operator knows if the camera is level and the amount of film used. The finder is fitted with a parallax adjustment giving the correction for "close-ups". When additional lenses are supplied supplementary finder lenses are provided so that the finder picture is corrected although the angle of view is altered. In the case of long focus Tele-Lenses giving a narrow angle a special telescopic finder fitted to the top of the camera is advisable.

LENSES

The lenses normally fitted are the 2 in. (50 mm.) F/1.9 or F/3.5 Ross "Xpres" Lenses, and extra lenses can be supplied to any focus mounted on "N.S." Focussing Mounts. These mounts can be expeditiously removed from the camera, and are perfectly light tight.

The camera is driven by two springs, both of which are THE wound to the full at starting, but either spring can be wound at any time, even when the camera is in action or running. MECHANISM Absolutely silent ratches are employed, so that no attention is drawn to the

camera whilst winding. A regulator permits the film to be driven at any desired rate from 10 to 24 frames a second, and provided the camera is loaded with fresh and properly perforated film, it will drive almost 200 ft. with one wind of the mechanism. forated film, it will drive almost 200 ft. With only white of a picture and this is situated camera is provided with a punch to record the end of a picture and this is situated at the front of the instrument. The gate is designed to eliminate scratching or at the front of the instrument. It is at the front of the instrument. It is satisfied while each picture is taken. It is "static" markings and holds the film rigid while each picture is taken. It is "static" markings and leaning is necessary. The camera is loaded in a few easily removed when cleaning is necessary. There is no threading up. seconds.

SUPPLEMENTARY FITTINGS FOR SPECIAL WORK

A Reflex Focussing Finder can be had which magnifies the image, and by its use close-up pictures and those given with Tele-photo Lenses can be correctly focussed. For scientific work, extension tubes can be supplied so that full-sized or enlarged images may be obtained. Special means for releasing the camera from a distance, apparatus for delayed action, and focussing apparatus, to be used in almost any position can be added. Means for focussing and setting the iris from the back of the camera can be supplied, and these can be operated, if desired when the camera is in action.

The camera may be used on an ordinary tripod, its automatic action leaving the operator with both hands free.



THE "N.S." AUTO KINE' CAMERA-Regular Model-cont.

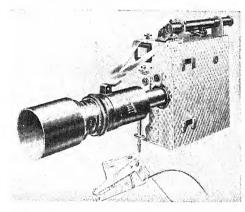
SPECIFICATION-continued.

Captain Roger Hilsman, United States Army, writes from Manila: "You may refer anyone to me regarding the Auto Kine' Camera and it will be my pleasure to recommend it above all makes of clockwork-driven motion picture

cameras. You have in me a living advertisement for your excellent product." From BRITISH INSTRUCTIONAL FILMS LTD..

Welwyn Garden City, Herts:

"You will be interested to get a report on the two clockwork cameras sup-plied. These plied. proved an unqualified success. never jammed and the pictures taken with them are rock steady. With regard to the distant release fittings, we found these of the utmost use. Dangerous animals can be allowed to walk right up to the camera, which was hardadvisable with a camera which had to be cranked by hand. Under the very roughest conditions they never gave us a moment's anxiety."



The "N.S." Auto Kine' Camera fitted with 17 in. Telephoto Lens, special Telescopic Finder and Court-Treatt Starting and Stopping Device.

Yours faithfully, For and on behalf of BRITISH INSTRUCTIONAL FILMS LTD., (Signed) C. COURT-TREATT.

NET CASH PRICES in LONDON of the "N.S." AUTO KINE' CAMERA and ACCESSORIES (REGULAR MODEL)

Size, $9\frac{1}{2} \times 4\frac{3}{4} \times 9\frac{1}{2}$ in. $(24 \times 12 \times 24$ cm.) Weight, 17 lbs. (7.8 kilos.)"N.S." Auto Kine' Camera, complete with film box as described and 2 in. (50 mm.) F/3.5 Ross "Xpres" Lens Net Cash Prices Code Word s. d. 120 SPEEDED Ditto, with 1½ in. (37 mm.) F/3.5 Ross "Special Xpres" Lens ... SPEDIEREN 120 Ditto, with 2 in. (50 mm.) F/2.9 Dallmeyer "Pentac" Lens 122 5 SPEDITIVO Ditto, with 2 in. (50 mm.) F/1.9 Ross "Xpres" SPEECHFUL 124 10 Lens Best Hand-Sewn Solid Leather Cade with lock SPEEDING and key and sling strap Extra Film Boxes for 200 ft. 35 mm. film each 0 SPEEDWELL



THE "N.S." AUTO KINE' CAMERA-Regular Model-cont.

| Best Hand-Sewn Solid Leather Case for two extra film boxes and extra lenses | t Cash Prices Code £ s. d. Word 4 10 0 SPEELGOED |
|---|---|
| Filter Holder for front of lens mount, to take 2 inch square filters | 2 2 0 SPELTVELD 0 10 0 |
| ordered with camera Devices for focussing, and altering Iris Diaphragm from back of the Camera; with Filter | 10 0 0 SPEEKJES |
| Holder Holder Court-Treatt Starting and Stopping Device N.S." Kine' Tripod with Revolving Top only | 8 10 0 SPEILOCH 8 10 0 SPEIDEL 33 0 0 SPELFONT |
| "N.S." Kine' Tripod with Universal Revolving and Tilting Top Set of two Cases for Kine' Tripod and Top "N.S." Unipod (page 474) | 55 0 0 SPELLFUL 4 10 0 SPELLASSI 1 15 0 STABILIFY |

SUPPLEMENTARY LENSES:

The price in each case includes the "N.S." Special Focussing Mount, Hood for Lens where necessary, and Finder Correcting Lens in frame fitting, for placing at the front of the regular finder lens, so that the view given by the finder will coincide with that given when using the supplementary lens. In the case of lenses longer in focus than 9 in. this finder lens is not supplied, but sighting pointers are fixed on the camera, and the Reflex Device for accurate focussing on near distances is recommended.

| | | sh F | | s Code Word |
|---|----|------|---|----------------|
| 1½-in. F/1.9 Ross "Xpres" Lens and fittings as described 1½-in. F/3.5 Ross "Special Xpres" and fittings | 14 | 10 | 0 | SPEELBORD |
| as described 2-in. F/1.9 Ross "Xpres" Lens and fittings | 10 | 10 | 0 | SPEELHOL |
| as described | 15 | 0 | 0 | SPEGNENDO |
| as described 3-in. F/1.9 Ross "Xpres" Lens and fittings | 10 | 10 | 0 | SPEGNIATE |
| an denomined | 17 | 0 | 0 | SPELTLAND |
| 3-in. F/3.5 Ross "Xpres" Lens and fittings as described | 11 | 10 | 0 | SPEELKAS |
| 4-in. F/3.5 Ross "Xpres" Lens and fittings as described | 13 | 0 | 0 | SPEELMAN |
| 6-in. F/4.5 Ross "Xpres" Lens and fittings as described | 14 | 10 | 0 | SPEICHEN |
| 61-in. F/5.5 Ross "Teleros" Lens and fittings as described | 14 | 0 | 0 | SPEELNOOT |
| 9-in. F/5.5 Ross "Teleros" Lens and fittings as described | 17 | 10 | 0 | SPEIREES |
| 11-in. F/5.5 Ross "Teleros" Lens and fittings as described | 20 | 0 | 0 | SPIESEN |
| 13-in. F/6.3 Ross "Teleros" Lens and fittings as described | 20 | 10 | 0 | SPEKMES |
| 17-in. F/6.3 Ross "Teleros" Lens and fittings as described 17-in. F/5.5 Ross "Teleros" Lens with special | 30 | 0 | 0 | SPEKMUIS |
| fittings and telescopic finder | 50 | 0 | 0 | SPEKNEK |
| 2-in. F/2.9 Dallmeyer "Pentac" Lens and fittings as described | 13 | 2.15 | 0 | SPEELSCH |
| 6-in. F/3.5 Dallmeyer "Dallon" Lens and fittings as described | 19 | 9 0 | 0 | SPEERHAI |
| | | | | |

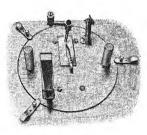




AUTO KINE' CAMERA

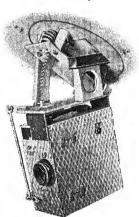
IS UNSURPASSED FOR AERIAL WORK

IT IS USED BY THE ROYAL AIR FORCE



Revolving turntable in floor of Aeroplane

THREE OF THESE
CAMERAS WERE USED
BY MESSRS. GAUMONT
FOR THEIR FILM
OF THE HOUSTON
EVEREST FLIGHT.



Underside of Aeroplane showing Camera

These illustrations show the value of our mechanical drive for aeroplane work. The two handles, in the upper illustration, serve to rotate the Camera fixed under the Turntable, and to lift it into the plane in order to insert a fresh film.

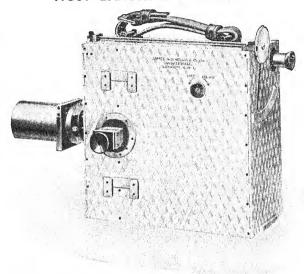
SINCLAIR LONDON



AUTO KINE' CAMERA

STUDIO MODEL

THIS IS THE AUTOMATIC CAMERA DE LUXE AND HAS ALL THE REFINEMENTS REQUIRED BY THE MOST EXACTING WORKERS.



The "N.S." Auto Kine' Camera with rear focussing and iris controls, Reflex finder, Filter holder and Lens Hood.

IT DRIVES NEARLY 200 FT. 35 MM. FILM WITH ONE WIND OF THE MECHANISM.

IT HAS FOCUSSING AND IRIS CONTROLS ARRANGED TO WORK AT THE BACK OF THE CAMERA AND THEY CAN BE USED WHILE THE INSTRUMENT IS RUNNING.

IT CAN BE USED FOR "FADE IN" AND "FADE OUT" EFFECTS.



THE "N.S." AUTO KINE CAMERA

STUDIO MODEL -- continued.

IT CAN BE USED FOR "MIXES."

IT HAS A "ONE TURN ONE PICTURE" HANDLE.

IT HAS A FINDER ADJUSTABLE FOR PARALLAX.

IT CAN BE RUN AT SPEEDS VARYING FROM 10 TO 24 FRAMES A SECOND.

IT HAS A FILTER HOLDER INTO WHICH FILTERS CAN BE INSERTED AND QUICKLY CHANGED.

IT HAS A REFLEX FOCUSSING DEVICE PERMITTING OF ACCURATE FOCUSSING WHEN TAKING "CLOSE UPS" OR WHEN USING LONG FOCUS LENSES.

This model is in appearance and general construction very similar to our Regular Model but embodies all the additions that have been fitted from time to time. The measurements of the camera body and boxes are the same as those of the Regular instrument, but the boxes differ in construction so that the film may be reversed in them. It drives 180 feet with one wind of the mechanism.

Extra lenses and their fitments cost the same price as those listed for the Regular Model, but the special focussing and iris controls from the back of the camera are not fitted to these extra lenses.

37 . 0 1

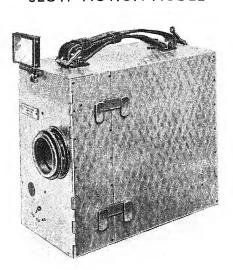
| | Prices | Word | |
|--|---------------------|-----------|--|
| Price of Studio Model with F/1.9 Ross "Xpres" Lens | £ s. d. 199 10 0 | SPEKTRUM | |
| Extra Film Boxes each | 8 10 0 | SPELATORE | |
| 2 in. square "K" or "X" Filters each | 0 10 0 | | |
| Hand-sewn Solid Leather Case to hold camera as above | 5 0 0 | SPELAZZO | |
| " N.S." Unipod (page 474) | 1 15 0 | STABILIFY | |
| "N.S." Tripod Stand with Universal control for Panoram and Tilting Top | 55 0 0 | SPELLFUL | |
| rumg rob | | | |

SINCLAIR LONDON



AUTO KINE' CAMERA SLOW MOTION MODEL

THE FIRST AND ONLY CLOCKWORK DRIVEN **CAMERA** FOR SLOW MOTION WORK.



IT REQUIRES NO TRIPOD

NO WINCH HANDLE

NO FLEXIBLE DRIVE

NO MOTOR

NO ACCUMULATOR

NO HARD WORK

IT HAS VARIABLE SPEED 40 to 120 FRAMES A SECOND.

IT RUNS 100 FEET WITH ONE WIND OF THE MECH-ANISM.

IT PASSES ONLY 18 INCHES FILM BEFORE FULL RATE IS OBTAINED.

IT CAN BE STOPPED AND RE-STARTED with a loss of only two feet of under speeded film.



THE "N.S." AUTO KINE' CAMERA

SLOW MOTION MODEL—continued.

In general appearance this camera is very similar to our Regular and Professional Models, but somewhat smaller. It is only intended for the special work of analysing the sequence of motion. Pictures taken at a high rate of speed and shown at the normal rate have a great fascination for any observer, quite apart from their scientific value in deciding what actually takes place in a movement that is not seen by the eye. Hitherto cameras for this work have been exceedingly heavy and very costly. Driving the mechanism is generally a toil, and a great quantity of film is wasted before the instruments attain their indicated speed. In the "N.S." Camera the difficulties hitherto characteristic of this work have been surmounted. The camera is light and does not need a tripod. No laborious work is necessary. The mechanism is wound up and only requires a slight pressure on the camera release to set the film running at the rate decided upon, and there is no heavy loss of film when starting up.

Size, $10 \times 5 \times 8\frac{1}{2}$ in. Weight, 19 lbs.

| | Net Cash Prices | Code Word | | |
|---|--------------------|--------------|--|--|
| "N.S." Slow Motion Auto Kine' | £, s. d. | | | |
| Camera with 2 in. F/1.9 Ross "Xpres" Lens | 170 0 0 | SPERNES | | |
| Hand-sewn Solid Leather Case with lock and key and sling strap | 4 15 0 | SPERNIMUS | | |
| Extra Film Boxes for 100 ft. 35 mm. film | 8 10 0 | SPERNETIS | | |
| "N.S." Unipod (see page 474) | 1 15 0 | STABILIFY | | |
| "N.S." Kine' Tripod with Universal control to Panoram and Tilting | | | | |
| Top | 55 0 0 | SPELLFUL | | |



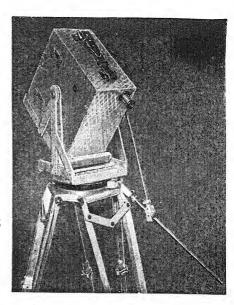


KINE' TRIPODS

THEY ARE
THE BEST
IN THE
WORLD

THEY
COMBINE
LIGHTNESS
WITH
RIGIDITY

MARVELLOUS RANGE OF MOVEMENT



This stand is made entirely of metal, and although weighing only 19 lbs. is the strongest and steadiest stand yet produced. The elevating head is made in two forms, Type I being for the "N.S." Auto Kine' Camera and Type II for the "N.S." Standard Kine' Camera and which can be fitted to most other cameras.

The novel feature of both types is the method by which the weight of the camera is kept in the centre of the tripod, no matter at what angle the camera is tilted. Type I, as used for the 'N.S.' Auto Kine' Camera, allows the camera to revolve on its axis so that it can be used pointing directly upwards, or the camera may be inverted for trick work. Type II, as used for other cameras, trated on page 488. This can be lifted or depressed to an angle of 40° from the horizontal. The lever arm controls all the movements, so that with both types the cameras can be made to traverse either in a vertical, horizontal, or diagonal direction. The start of the movement in either direction is absolutely without jerk, and can be arrested immediately. The mechanism contains no gearing of any kind is of great simplicity, and not liable to derangement.

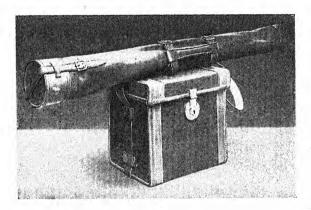


"N.S." AUTO KINE' TRIPOD-continued.

The legs are quickly detachable for transport and can be fixed instantly.

The height can be altered with great facility, the legs sliding very freely, and the changing being easy and certain. A special fixing is provided for our Auto Camera which allows it to be affixed or detached in two seconds.

| The Stand complete with revolving and tilting top, Type I, for "N.S." | | Ca ice: s. | 3 | Code Word | | |
|---|----|------------------|---|--------------|--|--|
| Auto Kine' Camera (Page486) | 55 | 0 | 0 | SPELLFUL | | |
| Ditto, Type II, for "N.S." Standard Kine' and other makes (Page 488) | 55 | 0 | 0 | SPELONCA | | |
| The Stand with revolving top only weighing 12 lbs. 10 ozs., costs | 33 | 0 | 0 | SPELFONT | | |



For transit we recommend our Mail Canvas Cases. These are strengthened with leather binding. Two cases are supplied, one holding the Tripod Legs and the other the Revolving and Tilting Tops. The weight of Tripod, complete with the two cases, is 26 lbs. (12 kilos.).

Price of the Two Cases

Price Code £ s. d. Word 4 10 0 SPELLASSI



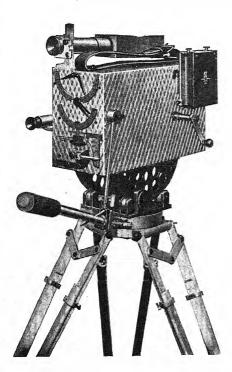


No. 4 STANDARD

KINE' CAMERA

with HAND and ELECTRIC DRIVE

(NEWMAN & SINCLAIR'S PATENTS)

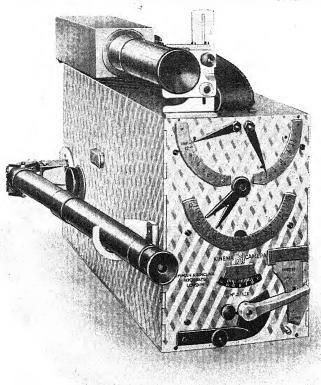


THIS
CAMERA
CAN
BE
SUPPLIED
FOR USE
WITH
ORDINARY
ELECTRIC
SUPPLY

"N.S." No. 4 Standard Kine' Camera with motor, on "N.S." Kine' Tripod with Revolving and Tilting Top.



THE "N.S." STANDARD KINE' CAMERA-continued



Supplied amongst others to:

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MESSRS. GAUMONT-BRITISH PICTURE CORPORATION
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THE METROPOLITAN MUSEUM OF ART, NEW YORK
THE NEW YORK ZOOLOGICAL SOCIETY
MAJOR RADCLYFFE DUGMORE and
MR. CHERRY KEARTON



THE "N.S." STANDARD KINE' CAMERA-continued.

- We have no hesitation in stating that our No. 4 "N.S." Kine' Camera is the most perfect instrument that has ever been made for the highest class Studio or Topical work, and is equally without peer for the Explorer or Scientist.
- In general form the No. 4 Model is some thing like the Newman-Sinclair instruments which achieved so much success in the Great War, but the details of construction are such as to meet the demands of advanced modern studios where "effect" studies play a prominent part. The No. 4 "N.S." Kine' Camera greatly simplifies the production of the most elaborate effects, while its accuracy and reliability of construction makes it pre-eminent in this and every other sphere of moving picture photography.

SPECIFICATION.

Camera built entirely of metal, all parts being milled out of the solid, no castings being used. The metal is almost as light as aluminium, but is free from that metal's instability, and in its general characteristics and properties for standing shocks and strains, resembles mild steel. Being light in colour, it reflects heat, and is therefore particularly adapted for tropical climates.

All works easily visible when the doors are opened, and every part accessible for cleaning.

Reversing Action by merely turning the handle backwards. No bands to be shifted.

Square Film Boxes (holding 400 ft.), entirely without projections which automatically gear when placed in the camera. The absence of projections and the square form make them the most convenient for packing and transport. These boxes are provided with mouths which automatically open when closing the camera, and they entirely obviate electrical markings or "static."

Film Counter. This is at the back of the camera, and shows the amount of exposed film in the camera, and the length to a single picture determined at any moment. Each individual picture is recorded, and can be returned to after exposing any length of film.



THE "N.S." STANDARD KINE' CAMERA-continued.

Focussing can be accomplished by three methods. Firstly, by a reflex focussing arrangement which carries a magnifying eye-piece or periscope on the side of the camera. Secondly, by an accurate scale focussing seen from the back of the camera. Thirdly, by a prism eye-piece for magnifying the image through the film itself.

Iris worked from the back of the Camera, by the movement of a lever, accurately scaled. The same scale may be adjusted to automatically work with both 2 and 3 in. lenses, without alteration.

Lenses interchangeable on interchangeable fittings, which can be attached or detached with one hand only.

Single picture handle always in position.

Brilliant Finder. Each camera is supplied with a brilliant finder, which is quickly attached or removed from the top of the camera, and this finder is without parallax, and is provided with a scale for accurately setting its frame for close-up work.

Lever Shutter Fade. The shutter is nearly 180° when open and this shutter is controlled by a lever at the back of the camera. Depressing this lever closes the shutter, and when the shutter is quite closed a catch holds the lever in position, the mechanism at the same moment is stopped by a brake. A second catch is provided, which, while retaining the shutter in the closed position, allows the mechanism to run freely, so that in "mixes" the film can be worked backwards to the desired amount without exposing it. The opening of the shutter can thus be controlled from the back of the camera. A scale is provided which shows the amount of opening and the setting can be fixed by turning a milled knob. The camera is provided with a clamping non-scratching gate; the film is quite free during its movements and is guided in such a way that neither the back nor the front of the film touches any part except the edges. It is automatically dropped upon a pilot pin and a clamp holds it flat during exposure. The complete gate is easily removed for cleaning.

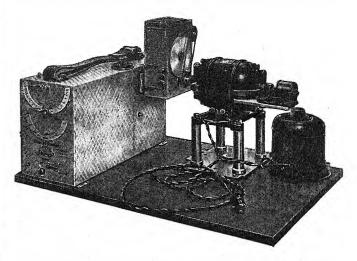
SUPPLEMENTARY FITTINGS.

The "N.S." Automatic Electric Drive. Owing to the extraordinary ease with which the "N.S." Kine' Camera runs, we are able to drive it with a small motor that only weighs 3½ lbs. The power for the motor is obtained either from any ordinary electric supply, or from a battery which, with its containing box, weighs 18 lbs. and will drive 4,000 ft. without recharging. When the camera is used with the ordinary electric supply a Transformer and Rectifier, both light and portable, are then sent with the outfit. For those who require it, we also provide a Relay Instrument complete in box, by means of which the camera can be started and stopped at any distance up to 100 yards, and longer distance relays can be made to order. Full particulars will be found in our Kine' Camera Catalogue.

The "N.S." Vignetting and Dissolving Apparatus. This apparatus consists of a bellows fitting carrying at the front our improved "N.S." Iris Attachment and Adjustable Card Carrier. This iris can be set to vignette any portion of the picture, and is so constructed that it gradually and entirely closes and it can also be set to open or close to any definite point. The front card holder enables a roller blind or curtain effect to be produced. A second attachment forms a complete vignetting device, which enables squares, rectangles, ovals or blind effects to be produced at any part of the picture.



THE "N.S." STANDARD KINE' CAMERA—continued.



The "N.S." Standard Kine' Camera as supplied to Cambridge Zoological Laboratory, taking pictures at speeds from 10 to 40 per second and with geared control to take pictures at intervals of 1, 2, 4, 8, 16 and 32 seconds, for use with mains current.

Concerning the tour of H.R.H. The Prince of Wales in South Africa and South America, H. Bruce Wolfe, Esq., of the British Instructional Films, sent the following extract from a report by Mr. Barkas, their chief Operator:—

"I find that it is very handy, light in weight, simple in operation and exceedingly quick off the mark. It is silent. As a machine for this type of work, or for work in the Tropics or in severe cold, I would recommend the Newman-Sinclair."

Mr. Harry Burton, of the Metropolitan Museum of Art, New York, writes:—
"The Camera acted splendidly, as always."

Captain J. Noel, F.R.G.S., the official photographer to the Mount Everest Expedition, writes:—

"At all times the camera behaved perfectly, and during all my climbs I found the apparatus never a burden but always a pleasure to operate. I could not have got my pictures unless my camera had been so portable and efficient."

The "N.S." Camera is the easiest camera to thread, using a minimum quantity of film and can be threaded as easily backwards as forwards. It is the lightest running camera ever made.

Size of Camera with 2 film boxes, $14 \times 5\frac{3}{4} \times 8$ in. $(355 \times 146 \times 204 \text{ mm.})$. Weight, 18 lbs. 5 oz. (8.3 kilos.).



Code

Price

THE "N.S." STANDARD KINE' CAMERA-continued.

NETT CASH PRICES IN LONDON

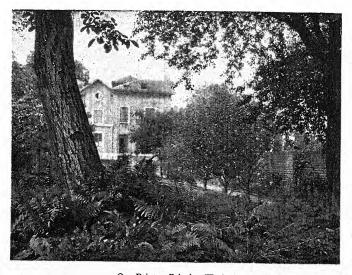
| No. 4, "N.S." Standard Kine' Camera, as described, with 2 in. F/3.5 Ross "Xpres" Lens, complete with 2 film boxes, "N.S." brilliant finder, and reflex focussing finder | £ | s. | d. | Word |
|---|-----|------|-----|------------|
| with periscopic tube attachment, fade out to shutter | 250 | 0 | 0 | SPARGEL |
| Ditto, with electric motor and battery | 287 | 10 | 0 | SPARGOUTE |
| Ditto, with electric motor, Transformer and Rectifier for use with ordinary electric supply. State voltage when ordering and if A.C. or D.C | 287 | 10 | 0 | SPARHAFEN |
| | | | | |
| EXTRAS AND SP | ARI | S | | |
| Extra for $F/1.9$ "Xpres" instead of $F/3.5$ | | 4 10 | 0 | |
| Duralumin Light-tight Film Boxes, each holding 400 feet each | | 8 10 | 0 | SPAHEES |
| Relay Instrument complete in box, for driving camera at any distance up to 100 yards | 2 | 0 (| 0 | SPAIANDO |
| "N.S." Geared Mechanism for automatically taking slowly moving objects. Taking single pictures in 1, 2, 4, 8 or 12 seconds | 2 | 0 (| 3 0 | SPAIATE |
| "N.S." Vignetting and Dissolving Apparatus, with attachments for every kind of studio dissolving and fade effects | 2 | 5 (| 0 0 | SPARIMENTO |
| Best Hand-Sewn Solid Leather Case to hold No. 4 Kine' Camera and finders | | 6 15 | 5 0 | SPADDLE |
| Supplementary Lenses with Control adjust- ments for focussing and altering diaphragms from back of the camera: | - | | | |
| 1½ in. (37 mm.) F/3.5 Ross "Xpres" Lens Special | 1 | 5 I | 0 (| SPANADER |
| 3 in. (75 mm.) F/3.5 Ross "Xpres" Lens | | 5 I | 0 (| SPADONIES |
| Supplementary Lenses in "N.S." Special Helical Focussing Mounts, Hoods and finder masks. | 1 | | | ** |
| 4 in. F/3.5 Ross "Xpres" Lens | . 1 | 5 | 0 | SPANIOPES |
| 5 in. F/3.5 Ross "Xpres" Lens | . 1 | 7 1 | 0 | SPANKALB |
| | | | | |

For Telephoto Lenses and other fittings see Kine' Catalogue.



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|---|----------|
| Dometing Till | • /- |
| Panchromatic Films 50 per cent, extra. | |

| V.P. Kodal No. 1 Brownie No. 1 Ensignette Black & White) | Brownie | Eye, No. 1A Kodak | Kodak & 41×31 | Post- card 5×4 | 10×15 cm. | ½-plate and 7×5 |
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Over half-a-century's experience is behind "City Sale" service. Every new piece of apparatus is examined and tested by our staff, and the knowledge gained is used to customers' advantage. We are always ready to help our customers and to give sound advice and demonstration of any apparatus without obligation. Write and tell us your needs.

Our postal service stands high in the estimation of every still and cine photographer who desires full attention to detail and quick delivery of his order. At "City Sale" the postal customer is assured of the same meticulous care and attention as if he were buying directly over the counter.

We have built up a large overseas trade by our intelligent handling of every order. Overseas requirements are understood by our experienced managers who deal personally with such orders. All goods are expertly packed, and safe delivery to any part of the world is ensured. Overseas buyers are required to send cash with order, and goods are despatched by return boat.

Everything, from the most recently announced apparatus to the smallest sundry is always in stock at our branches. No waiting—our stocks are large enough to cover all emergencies. Delay, often experienced when dealing elsewhere, is thus avoided. If you don't see what you want in our catalogue—please ask us!

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5—Model 70DA Bell &
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f/3.5 Cooke lens, 4" f/4.5
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6—16 mm. £58 17
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Lens, iris £2 2 0
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focussing mount £9 15 0
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Telephoto, iris £5 17 6
14—Dallmeyer Junior Adon
Telephoto, iris £1 10 0
15—102" F/7 Busch Bis-Telar,
iris £1 9 6



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\$7/15]19—12° F/5.5 Ross Teleross,
Cost £15/5/-, as new. £10 10 0
20—10° Dallmeyer Speedy 1/1
Plate Anastigmat Lens, f/4.5 iris
diaphragm. Cost £25, as new
£13 10 0

21—3B Dallmeyer Parent Portrait F/3, rack and pinion, 11 focus, iris and diffusion, unsoiled, Cost £22/-/. 48 17 6 22—No. 4 Dallmeyer Stigmatic, iris diaphragm, f/6, 7.6 focus

£3 18 6 23—8½" F/4.5 Ross Homocentric Lens, iris diaphragm . £2 10 0

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Press Focal Plane, upto-date model, f/4.5
Ernastar anast., self-capping F.P. shutter, large
brilliant direct finder,
3 A.B., D.D. sildes,
F.P.A., leather case, new
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18 17 6

25—1-pl. Tropical Nettel Press Focal Plane, 1/4.5 Zeiss Tessar lens, 2 tropical D.D. slides, leather case. ... £12 17 6 26—1-pl. T.P. Press Focal Plane, 1/4.5 Dallmeyer anast., focussing self-capping shutter, 1/10 to 1/1,000th, hooded screen, 3 D.D. slides, F.P.A. and leather case £11 7 6

27—1-pl. Sinclair Una Hand and Stand, full triple extension actuated by rack and pinion, Carl Zeiss double Protar f/6.3, giving 29 cm. in the singlets, N. & S. Accurate fully speeded shutter, rising and swing front, revolving back, 6 shides, F.P.A., Mackenzie slide, 12 envelopes and leather case, very fine outfit

28—4-pl. Tropical Sanderson, f/6 Aldis anast, N.S. Accurate shutter, 1/17th to 1/100th, double extension, rising and swing front, swing and reversing back, screen, Mackenzie slide, 12 envelopes £8 12 6 29—3½ x 2½ Miraphot Vertical Enlarger, fitted f/6.8 Novar anast lens, set of electrical fittings, base casel, as new £6 7 6

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Exeter, Devon.

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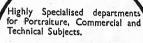
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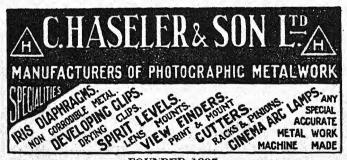
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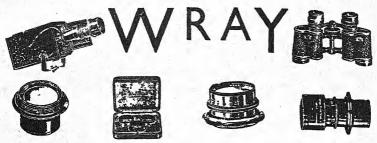


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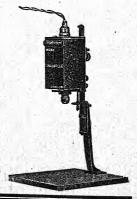
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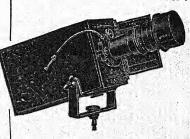
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| 1" | F/1.5 A | nastigr | nat | 10 | 9 | 0 | 0 | |
| 2" | 37.3 | ,, | | | 12 | 10 | 0 | |
| 2" | Plustra | F/4.5 | Telep | hoto | 3 | 15 | 0 | |
| 3" | ,, | F/3.5 | | ,, | 7 | 10 | 0 | |
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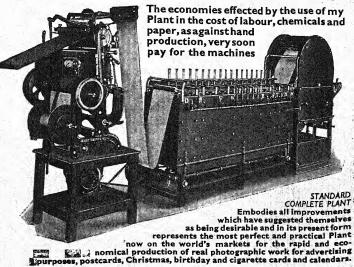
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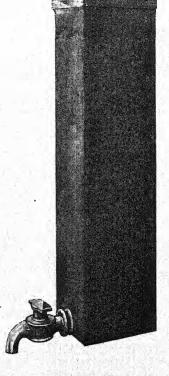
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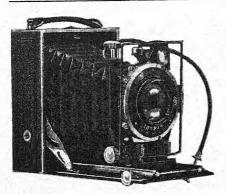
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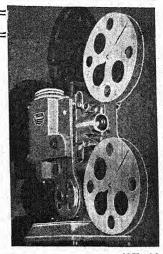


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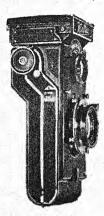
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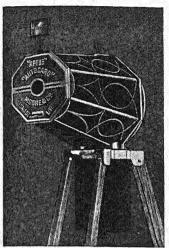
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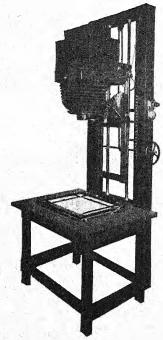
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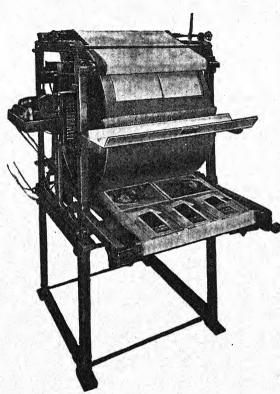
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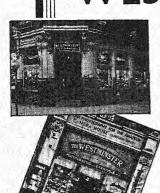
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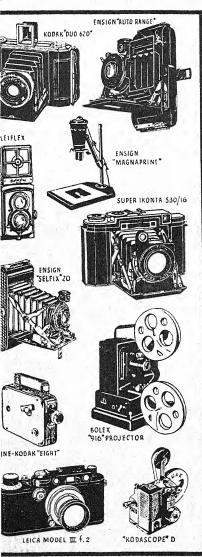
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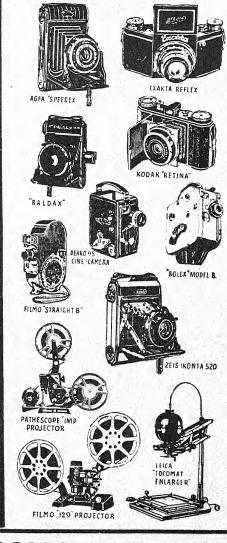
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Automatic opening to infinity, self-erecting optical finder, SCHNEIDER RADIONAR 2.9 Lens. Compur delay action shutter. Easy reading focussing scale. Light but very strong. Wonderful value, £6 15 0 (9 payments of 15s. 9d.). Also with Compur Rapid, speeds to 400th sec. £7 19 6

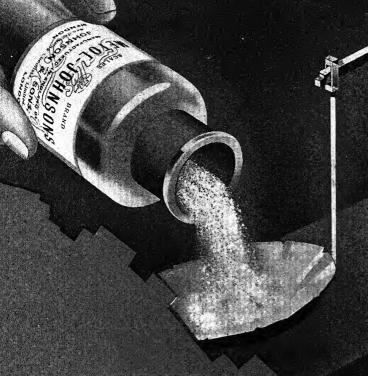
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packet.

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THE ZODEL LENS HOOD PROTECTS YOUR LENS FROM SUN, RAIN AND SNOW



Zodel Lens Hood when Closed

without the risk of splashes on the lens. The Zodel Lens Hood has three telescopic sliding sections designed so that they cannot wear away the dead-black lining which ensures the absence of reflection. The adjustable sunshade flap can be actually set to cast a shadow over the inside of the hood for really exacting work. Two Sizes: No. 1 fits lens flanges 1" to $1\frac{1}{4}$ ", No. 2 fits lens flanges $1\frac{1}{4}$ " to 2". No. 1 has opening at rear $1\frac{1}{4}$ " diam. No. 2 $1\frac{1}{2}$ ". Filter Socket to fit inside hood, to hold $1\frac{1}{4}$ " or $1\frac{1}{2}$ " Circular Unmounted Filters, 2/- each.

shots, too, can be obtained on wet days

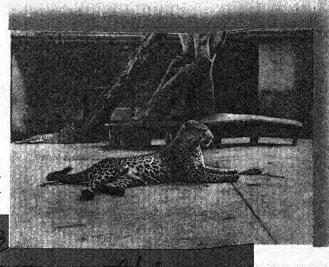
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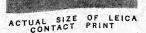
DIRECT FROM LEICA and OTHER MINIATURE FILM NEGATIVES



SIZE OF "AUTOMAX" PRINT

2/- A DOZEN (Any Quantity)

The making of "Automax" Prints forms part of our comprehensive service to Leica customers. They are ideal for all who wish to have Leica Prints of an appreciable size without



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We have specialised in the Leica and its accessories ever since it was first introduced to the English public—over 10 years ago. This 10 years of experience has taught us to appreciate fully the needs of the Leica user. We offer facilities which cannot be obtained elsewhere. (1) Transit envelopes are supplied free on request for safe delivery of your Leica spools for developing and printing. (2) Leica exposure record cards are available for registered Leica customers. (3) "Leica News and Technique" and other periodical aids are sent free. (4) Special binders for storing "Leica News" are sold to registered customers at 1/- each. (5) The Leica Manual, written by the world's best authorities on the Leica Camera is available at 21/- (postage 6d.). (6) Free technical information on all matters photographic. Every Leica camera and accessory is, of course, always actually in stock.

A Leica Customer says:

"I think it only right to let you know how pleased I am with your Leica service. The advice given by your technical department is the finest piece of help I have ever received."

Another Letter :

"The camera far exceeds my expectations for such a low price. I should be glad to receive further information concerning your many bargains."



The "Amateur Photographer" says:

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Note the following special Contax features:

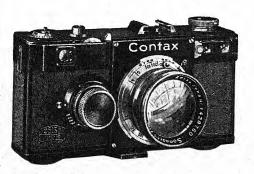
All metal construction, even metal focal plane shutter, 1/2 to 1/1000th second and Time.

Minutely accurate new pattern Zeiss Ikon rotating wedge distance meter with 3½" basis; coupled with lens focussing.

3 Automatic film transport by which double exposures are avoided.

4 Daylight loading is as easy as with ordinary roll film cameras.

Any film on the market for pictures 24 \times 36 mm. ($1\frac{1}{2}$ " \times 1") can be used.



6 Contax spools are specially recommended; they do not require rewinding.

7 Choice of twelve ZEISS LENSES; focal lengths from 1½ to 20". Apertures f/8 to 6/8.

tures f/8 to f/1.5.

The removable back of the Contax is a great advantage. It not only facilitates loading, but also makes the interior of the camera accessible for cleaning—an important point, especially with miniature negatives, since dust, if allowed to collect inside the camera, will inevitably appear as pinholes in the negative.

 COMTAX PRICES
 £
 s. d.

 540/24L
 Zeiss Tessar f/3.5, focal length 2"
 31 0 0

 540/24P
 Zeiss Tessar f/2.8, focal length 2"
 33 15 0

 540/24N
 Zeiss Sonnar f/2, focal length 2"
 41 0 0

 540/24J
 Zeiss Sonnar f/1.5, focal length 2"
 56 5 0

For further particulars ask for our brochures "The Connoisseur and the Contax," "The Ten Contax Lenses" and "Accessories for Contax Photography," free on application.



The only Camera with built-in Photo-Electric Exposure Meter

CONTAFLEX

The appearance of any new Zeiss Ikon camera is an event in the photographic world. It is scarcely an exaggeration to say that the introduction of the CONTAFLEX has caused a sensation.

The Contaflex is a new and distinctive precision camera type, combining the features of the Contax with the best features of the twin-lens reflex.

Let us run through the technical equipment of the Contaflex—the first miniature twin-lens reflex taking 24×36 mm. cine film. For the first time a photo-electric cell is built into a camera. The exposure meter of the Contaflex is so sensitive that it will give accurate readings, under all conditions, when other exposure meters fail to register. It is operated simply by adjusting a lever at the side of the viewing lens until the indicator in the side of the camera moves to its index mark.

The reflex principle does not permit sufficiently accurate focussing of miniature cameras if the finder picture is the same size as the negative, because the details are too small and dispersed by the grain of the screen; besides the depth of focus with short focal length lenses makes exact focussing difficult. A special Sonnar f/2.8 of long focal length, constructed to eliminate depth of focus, has been fitted to the Contaflex and provides a finder picture of double the film picture size. The special con-

film picture size. The special condenser screen gives an extraordinarily brilliant picture even at the corners, and, of course, the finder is compensated for parallax and a powerful magnifier is fitted inside the hood for specially accurate focussing.

The front and back of the hood form an Albada finder for sports (eye level) work, and for "self" portraits the front of this finder reflects the view and facilitates composition.

The Contaflex has the well-known Contax incorrodible metal focal plane shutter speeded from ½ to a real I/I,000th second, with time exposure, while a built-in delayed action release is only to be expected in a camera having such complete equipment.

No miniature camera can claim universality without interchangeable lenses. Six lenses are, therefore, available with the Contaflex:

Other Contaflex features are:—Contax spools, or any other system using 35 mm. film for 24×36 mm. $(1'' \times 1_2'')$ can be used. Plate back adapter and slides are available. Appliances for copying and close-up work. Shutter and film winder coupled, so that unintentional double exposures are impossible.

For Contaflex details ask for illustrated prospectus C.714.

CONTAFLEX PRICES ON APPLICATION

CONTA-FLEX

The Camera which does the Focussing

The Ikonta is already famous throughout the world as the Zeiss Ikon camera that is ready for use in an instant.

The SUPER IKONTA, as its name implies, has the constructional ever-ready features of the Ikonta plus something else, and that something is the

DISTANCE METER COUPLED WITH LENS FOCUSSING

made on entirely new principles, by which the accuracy of the best previous distance meters is combined with immunity from damage never before realised. The Super Ikonta is as quick as lightning in taking good pictures—good because you know beforehand that your pictures will be sharp. You press a button and the



No. 530/16

With Coupled distance Meter. In four sizes. No. 530. $2\frac{1}{4}$ " $\times 1\frac{3}{4}$ " for 16 exposures on usual $3\frac{1}{4}$ " $\times 2\frac{1}{4}$ " for 16 exposures on 16 exposures $2\frac{1}{4}$ " $\times 1\frac{3}{4}$ ". 8 exposures $2\frac{1}{4}$ " $\times 1\frac{3}{4}$ ". 8 exposures, or 16 exposures $2\frac{1}{4}$ " $\times 2\frac{1}{4}$ ", 8 exposures, or 16 exposures $2\frac{1}{4}$ " $\times 2\frac{1}{4}$ ", 8 exposures, or 16 exposures $2\frac{1}{4}$ " $\times 2\frac{1}{4}$ " $\times 2\frac{1}{4$

posures on usual 3½"× 2½" film.

SELF - ERECTING

mechanism automatically opens both camera and finder ready for use. A glance through the distance meter—a turn of the milled wheel—and the picture is automatically sharply focussed. A pressure on the shutter release and the picture is taken.

BRIEF SPECIFICATION

All metal body, self-erecting front, focusing by distance meter coupled with lens from Infinity to about 5 feet. Optical direct vision view finder, best leather bellows and covering. Zeiss Triotar or Zeiss Tessars, as listed, the latter in delayed action Compur Rapid shutters. No. 530, owing to its small dimensions, cannot be fitted with the delayed action feature.

The new Compur Rapid shutter is speeded from I second to I/500th second with No. 530—I/400th second with other sizes. With models fitted with Triotar we supply only the Klio everset shutter, I/5th to I/100th second and delayed action release feature.

SUPER IKONTA PRICES

| Code | Picture | _ Optical | Focal | Price | |
|----------|---------|---------------------|------------|-------|----|
| No. | Size | Equipment | Length | £. s. | d. |
| 530L | 2}"×13" | Zeiss Tessar f/3.5 | 23" | 18 12 | |
| *530/2H | 31"×21" | Zeiss Triotar f/4.5 | 48" | 14 7 | 6 |
| 530/2U | 31"×21" | Zeiss Tessar f/4.5 | 41" | 19 0 | Ō |
| 530/2L | 31"×21" | Zeiss Tessar f/3.8 | 41/ 41/ | 22 10 | ŏ |
| *530/15H | 41"×21" | Zeiss Triotar f/4.5 | 13" | 16 5 | ŏ |
| 530/15U | 41"×21" | Zeiss Tessar f/4.5 | 41" | 20 17 | ě |
| 530/16L | 21"×21" | Zeiss Tessar f/3.5 | 31 | 25 5 | ŏ |
| 530/16P | 21"×21" | Zeiss Tessar f/2.8 | 38" | 28 5 | ŏ |
| | | * Klio Shutter | | | |

SUPER IKONTA

The Ideal High-class Self-erecting Camera

The IKONTA is the best self-erecting high-class camera at a moderate price. It is extremely solidly built, and the many sizes, optical and shutter equipments enable it to meet the requirements of practically all roll film photographers.

SPECIFICATION

METAL BODY.

FRONT SELF-ERECTING. A simple pressure of the opening button erects camera ready for action.

Novar models covered with artificial leather. Tessar models with real medium grain black morocco leather. Leather Bellows. Tripod Bush.

FINDERS. With the Baby model, frame finder, or at an extra cost of 12/6, optical finder.

No. 520, optical direct vision finder; also, at small extra cost, detachable brilliant finder.

Nos. 520/2 and 520/15 have both brilliant finder and the new Albada optical direct vision finder (except No. 520/15E).

LENSES. Novar or Zeiss Tessar.

SHUTTERS. 3-speed Derval; 3-speed Telma with delayed action release. Compur shutter (with delayed action release for Models No. 520/2 and 520/15 only).

Nos. 520/18 and 520 take 16 pictures on the usual vest pocket and $3\frac{1}{4}$ "x 2 $\frac{1}{4}$ " spools respectively, No. 520/2 and 520/15 (except E model) are two-picture cameras, i.e. by using the mask provided, 16 pictures can be taken on the usual 8-exposure spool.

Supplied in the following four picture sizes for roll film only: No. 520/18 (Baby size) $1\S'' \times 1\S''$ No. 520, $2\S'' \times 1\S''$. No. 520/2. $3\S'' \times 2\S''$ or $16 \ 2\S'' \times 1\S''$. No. 520/15. $4\S'' \times 2\S''$ or $16 \ 2\S'' \times 2\S''$.



No. 520/2 Tessar

IKONTA PRICES

| Code No. | Size | Lens | Shutter | £ s. | d. |
|----------|--|----------------|--------------|-------|----|
| *520/18F | 1§"×1½" | Novar $f/3.5$ | Compur | 7 15 | 0 |
| 520/18L | ,,, | Tessar $f/3.5$ | Compur Rapid | 10 10 | 0 |
| 520E | 21"×13" | Novar $f/6.3$ | Derval | 4 17 | 6 |
| 520IT | ,,, | Novar f/4.5 | Telma | 6 2 | 6 |
| 520F | 33 | Novar $f/3.5$ | Compur Rapid | 9 0 | 0 |
| 520L | ** | Tessar $f/3.5$ | Compur Rapid | 11 17 | 6 |
| 520/2IT | 31"×21" | Novar f/4.5 | Telma | 7 17 | 6 |
| *520/2I | 33 | Novar $f/4.5$ | Compur | 9 12 | 6 |
| *520/2U | 22 | Tessar f/4.5 | Compur | 11 5 | 0 |
| 520/2L | - 11 | Tessar $f/3.8$ | Compur Rapid | 15 12 | 6 |
| 520/15E | $4\frac{1}{4}'' \times 2\frac{1}{2}''$ | Novar $f/6.3$ | Derval | 5 10 | 0 |
| *520/15I | 23 | Novar $f/4.5$ | Compur | 11 5 | 0 |
| *520/15U | 22 | Tessar $f/4.5$ | Compur | 13 0 | 0 |
| | | | | | |

*With new COMPUR RAPID Shutter, giving exposures to 1/500th second with No. 520/18F, 1/400th with 520/2 and 520/15, £1 2 6 extra

IKONTA

Roll Film Camera

The NETTAR simplifies photography and gives the amateur snapshotter so many advantages that it is easy to get good pictures every time

All who have used box cameras appreciate their simplicity. Unfortunately, this simplicity is only obtained at the expense of optical properties, which reduce the scope of box instruments.

The Nettar, with rapid real anastigmatic lenses, makes it possible to take pictures at times when other cameras, metaphorically speaking, have "gone to

bed." At the same time the Zeiss Ikon "Two dot focus setting" makes photography a matter of utmost simplicity for snapshots in a fair light all day ting" long. You simply set the dia-phragm to the red dot and the lens focus to its red dot and with shutter working at 1/25th second everything is sharp from 12 feet onwards. With the Nettar (except models with Compur shutter) all settings can taking pictures. (See illustration.)

be read and adjusted from the top of the camera whilst held in position for



BRIEF SPECIFICATION

The metal body is covered black leatherette (real leather for Compur shutter models). Metal parts nickel plated; wire release. The camera back is fitted with a spring film pressure plate. Tripod bushes.

Shutter. Choice of Derval (1/25, 1/50, 1/100th second), Telma (1/25, 1/50, 1/100th second and delayed action feature), Compur (1 second to 1/250th second and delayed action feature), or Klio (1 second to 1/150th second and delayed action release). All give Time and Brief Time exposures.

Optical Equipment. Choice of Nettar Anastigmats f/6.3 or f/4.5, or Tessar f/4.5. Two view finders. A brilliant view finder for taking pictures finders. A brilliant view finder for taking pictures at waist level; for eye-level a direct vision finder is provided.

Dimensions: 13"×33"×6". Weight: 20 ozs.

No. 515/2DT For 31" × 21 Roll films 8 exposure spools.

| 15-15. | MALIAM | PRICES | | | |
|-----------|--------------------|-----------------|---|----------|----|
| Code No. | Lens | Shutter | £ | s. | d. |
| 515/2C | Nettar $f/6.3$ | Derval | ŝ | s. 15 | 0 |
| 515/2CS | Nettar $f/6.3$ | Telma with de- | _ | | - |
| | | layed action | 4 | 7 | 6 |
| 515/2CK | Nettar $f/6.3$ | Klio | 5 | 10 | 0 |
| 515/2DT | Nettar $f/4.5$ | Telma | 5 | 10 | Ō |
| 515/2DK | Nettar $f/4.5$ | Klio | | 15 | ŏ |
| *515/2DCp | Nettar $f/4.5$ | Compur normal | 7 | - 5 | Ó |
| 515/2BCpR | Nettar $f/3.5$ | Compur Rapid | 9 | 10 | ō |
| *515/2U | Zeiss Tessar f/4.5 | Compur normal | 9 | 17 | 6 |
| | Leather Case | *** | | 7 | 6 |
| Bir/8 | Zeiss Ikon Perno | x Film, 8-expo- | | | _ |
| | | | | | |

METTAR PRIOR

sures $3\frac{1}{4}$ × $2\frac{1}{4}$ 1

* With Compur Rapid—1 second to 1/400th second—
£1 2 6 extra.

NETTAR

The Camera for the Pocket and a Twin-lens Camera

SUPER NETTEL



The SUPER NETTEL is a recent Zeiss Ikon introduction and takes pictures $I_{\frac{1}{2}}^{1''} \times I''$ on perforated cine film. It takes the convenient Contax spool, but any system using perforated cine film for 24 × 36 mm. negatives can be used. The Super Nettel is closed by a hinged baseboard, thus protecting the lens and bellows from dust and damage when the camera is not in use.

While it does not provide for the use of a battery of lenses the Super Nettel has in its construction most of the other

Lenses is given—the Triotar f/3.5, Tessar f/3.5 or Tessar f/2.5 and the distance meter is an integral part of the instrument, and is coupled with the lens focussing. The entirely metal focal plane shutter gives automatic exposures from f/f/2 to f/f/2. 1/5th to a guaranteed 1/1000th second, as well as time exposures.

SUPER NETTEL PRICES

| | £ | s. | d |
|---|----|----------|---|
| Zeiss Triotar f/3.5, focal length 2" | 18 | s. 12 | 6 |
| Zeiss Tessar $f/3.5$, focal length 2" | 22 | 5 | Ö |
| Zeiss Tessar $f/3.5$, focal length 2" Zeiss Tessar $f/2.8$, focal length 2" | | 15 | ō |
| NoteNo other lenses can be supplied. | | | |

Super Nettel catalogue on application.

IKOFLEX



The IKOFLEX is a beautifully made twin lens camera. The image is seen on the ground glass screen the right way up and is shielded from extraneous light by a convenient hood. The view finder is the full size of the picture and everything seen in the finder is recorded on the film. The price is a most compelling one, since for the first time in the history of photography a complete

pelling one, since for the first time in the history of photography a complete twin lens reflex, with a high class f/4.5 anastigmat, is available for the small sum of £7 15 0.

The Ikoflex specification can be summed up as follows:—Die cast body, lever focussing, depth-of-focus scale, choice of shutter as listed, condenser ground glass screen with extra brilliant illumination, Novar f/4.5 or Novar f/6.3, automatic winding-on for film with counting disc. Capacity 12 expowith counting disc. Capacity 12 exposures $2\frac{1}{4}$ on usual 8-exposure $3\frac{1}{4}$ roll film.

IKOFLEX PRICES

| Code No. | Lens | Shutter | £ | | d. | |
|----------|---------------|---------|----|----|----|--|
| 850/16E | Novar f/6.3 | Derval | 6 | 12 | 6 | |
| | Novar f/4.5 | Derval | | 15 | 0 | |
| | Novar f/4.5 | Klio | 8 | 10 | 0 | |
| | Novar $f/4.5$ | Compur | 10 | 2 | 6 | |
| -5-, | 21111111111 | Rapid | | | | |

Ikoflex folder on application.

SUPER

Always use Zeiss Ikon Pernox Film

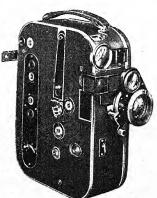
ZEISS IKON PERNOX FILM

ORTHO and PAN. H. & D. 2700. DIN. 150

Pernox Film enjoys a high reputation for reliability. In spite of its high speed there is ample latitude in exposure, and also in development. It is supplied coated with either ORTHOCHROMATIC or PANCHROMATIC emulsions at the usual standard prices for high speed film. Pernox ORTHOCHROMATIC is specially sensitive to yellow and green and requires no special treatment in development. It may be developed in a safe ruby light without taking any special precautions. Pernox PANCHROMATIC is sensitive also to red and orange and even without a filter will give good monochromernedering of all colours. Both emulsions are specially treated for halation and the Zeiss Ikon feature of a thin coating of gelatine over the sensitive emulsion prevents scratches from minute particles of dust, etc., when the film is passing through the camera.

Pernox Film is supplied in all the usual roll film sizes. Film packs are available only with Ortho emulsion.

MOVIKON



The MOVIKON is the new Zeiss Ikon cinetaking camera to take all makes of 50 ft. or 100 ft. cine spools—it provides in its construction technical perfection and refinements not hitherto obtainable in 16 mm. apparatus. For instance, the distance meter is coupled with the lens focusesing. Compensation for parallax is automatically provided for. A delayed action release and a special device for predetermining the footage to be used for delayed action shots are other important features obtainable for the first time in 16 mm. cine apparatus. The shutter is adjustable, and speeds from 1/25th to 1/1200th second can be obtained as well as slow motion shots. The lens is the famous Zeiss Sonnar f/1.4 in interchangeable mount, and other focal lengths are provided.

Price with Zeiss Sonnar f/1.4 ... 98 10 0

Further particulars on application.

All prices quoted are liable to alteration without notice.

The Zeiss Ikon general catalogue of cameras, photographic accessories and material is published about April or May each year. This publication will contain full descriptions and will be sent by post for threepence in stamps.

Abridged List, November 1935

MOVIKON



The Eagle Eye of your Camera

ZEISS

PHOTOGRAPHIC LENSES

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SURVEY OF ZEISS OBJECTIVES AND ACCESSORIES WITH THEIR PRINCIPAL APPLICATIONS

UNIVERSAL OBJECTIVES

Tessars F/4.5, F/3.5, F/6.3,

Tessar F/2.8 for small cameras.

Double Protars F/6.3 to F/7.7 and Protar Sets (the single components may be used as long focus objectives at full aperture).

Dagor F/6.8 (back lens may be used stopped down as

a long focus lens).

SPECIAL OBJECTIVES

FOR CINEMA WORK

Biotar F/1.4, ultra-rapid objective, Tessar F/2.7,
Tessar F/3.5 of short focus,
Tele Tessar F/6.3 special objective of long focus,
Kino Tele Tessar F/4 rapid telephoto objective,
Sonnar F/1.4, ultra-rapid objective,
Sonnar F/2.8,
Sonnar F/4, special objective of long focus.

FOR PORTRAITURE

Tessar F/4.5 Tessar F/3.5 in the longer foci Tessar F/6.3 Tessar F/6.3 Tessar F/5, f=50 cm. and f=70 cm. Triplets F/4.8, f=50 cm., F/5, f=70 cm. and F/7, Tele Tessar F/6.3.

FOR SPECIALLY RAPID ACTION WORK

with Press and reflex cameras with focal plane shutters. Biotessar F/2.8

and for the small size camera Biotar F/2.

Sonnar F/1.5, F/2 and F/4.

FOR WIDE ANGLE WORK

Dagor F/9, Protar F/18, Hypergon F/22.

FOR AERIAL PHOTOGRAPHY

Tessar F/4.5, Tessar F/5, f=50 and f=70 cm. Triplets F/4.8, f=50 cm., F/5, f=70 cm. and F/7, f=120 cm.



SURVEY OF ZEISS OBJECTIVES AND ACCESSORIES WITH THEIR PRINCIPAL APPLICATIONS—Contd.

FOR TELEPHOTOGRAPY and Large Image Pictures,

Tele Tessar F/6.3, Magnar F/10, f=45 cm. Triplet F/7, f=120 cm.

Composite Tele Objectives, particularly for specially long distance work.

FOR PHOTOGRAPHY WITH SPECIALLY SHORT WAVE ULTRA-VIOLET LIGHT, ABOVE ALL FOR CRIMINOLOGICAL AND SCIENTIFIC WORK,

Quartz Anastigmat F/4.5, with or without chromatic correction.

OPTICAL ACCESSORIES for

photographic objectives.

DISTARS and PROXARS;

attachment lenses for lengthening and shortening the focus.

YELLOW and GREEN GLASS SCREENS:

filters for neutralising the difference of colour perception between the eye, the Orthochromatic plate or the Panchromatic plate.

A-DUCARS:

filters for colour photography with Agfa screen plates with or without lens effect for neutralising the plate thickness.

INFRA RED FILTERS:

Glass filters coloured in the bulk.

OPTICAL EQUIPMENT for PROCESS WORK

Apo Planar, Apo Tessar,

with reversing prisms and mirrors, revolving collars,

filter cells,

R-yellow filters and R-colour filters.

Focusing Microscope and Focusing Magnifier.



ZEISS F/2.8 TESSAR

FOR SMALL CAMERAS

A new F/2.8 Tessar which comes under the new Tessar patents granted a few years ago. Angular field over 50° at full aperture. Definition brilliant and uniform as with all Zeiss Tessars.

The foci, 5 and 6 cm., can be fitted into the smallest size Compur Shutters oo or ooR without loss of aperture, and their design enables them to be fitted to any small size camera which takes an F/3.5 Tessar, of the same focal length, in Compur Shutter. The longest focus available is 8 cm.

ZEISS R-BIOTAR F/0.85

A special objective of unequalled rapidity, designed in the first place for cineradiography, but since applied also to sound-on-film cine and other work. For substandard film. Full details and particulars of cine cameras to which it has already been fitted, on application.

ZEISS BIOTAR F/I.4

CINEMA ANASTIGMAT

Definitely superior at any aperture to any other lens used at the same aperture.

Angular field about 42°. The 4, 5 and 7 cm. lenses amply cover standard film and the 2 and 2.5 cm. lenses small film (12.8 mm. diagonal).

ZEISS PHOTOMICROGRAPHIC APPARATUS

MIFLEX Universal Camera Attachment for plates 12×9 cm. and $9 \times 6\frac{1}{2}$ cm. or films 4×3 cm. and 36×24 mm.

A frosted observation screen, the use of ordinary microscope eyepieces and rapid attachability are its outstanding features.

CONTAX-PHOKU (image size 36×24 mm.)

The photomicrographic adaptation of the ordinary CONTAX miniature camera.

STANDARD VERTICAL CAMERA II

A rigid universal outfit incorporating a suitable lightsource. May be used for transmitted or incident light and in light or dark field.



ERE HE COMES ON THE



PATHÉSCOPE

BRITISH MADE

9.5 mm HOME MOVIE

PROJECTOR

For 30 ft. and 60 ft. reels of film. Here is the new Pathéscope 9.5 mm. outfit for showing real motion pictures in your home. Made throughout of solid high pressure die castings, with the shutter and optical system designed on the best cinematographic principles, the "Ace" gives a brilliantly illuminated picture 2 feet wide at 8 feet.

In price, size and facile performance the "Ace" is first-class for constant use in every home. It is supplied complete with resistance for all voltages from 110 up to 250, or it can be used with accumulators where other electricity is not available.

376

COMPLETE WITH RESISTANCE FOR ALL VOLTAGES NO 2 250

ES ARE

TRUNPS

PATHÉSCOPE



British Made

556

THE 9.5 mm. "IMP"-roved MODEL

One of the finest miniature home cinemas, complete in all details, for every home. The "Imp" provides brilliantsy illuminated, steady and correctly centred pictures. Note the easy film threading through the pivoted lamphouse and the compactability of the outfit. The "Imp" for all voltages or for use with accumulators, for showing 30 ft. and 60 ft. reels.

The "Imp" can be fitted with a MOTOR DRIVE (£1. 15. 0.) and a SUPER ATTACHMENT (17/6) for showing 300 ft. of film at one time, or the complete motor-driven outfit for showing 300 ft. of film bought outright for £7. 0. 0.

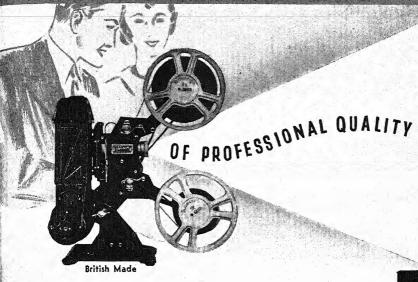
HAND TURNED COMPLETE WITH RESISTANCE

£4. 12. 6

30ft.REEL 3/9

60ft REEL 6/6

REAL MICKEY



THE 9.5 mm. "200-B"

Fitted with a 200 watts lamp for direct and brilliant screen illumination. The ideal projector for use on every occasion, especially when large pictures are required. Removal and re-winding of films at will; steady projection; fan-cooled and asbestos-lined lamphouse and sprocket feed. Pictures 8 feet wide and more easily obtainable. For use on all D.C. and A.C. mains from 200 to 250 with Double Resistance, or direct on 100-110 volts supply.

Resistance with lamp switch and separate terminals for voltages between 200 and 250 £1. 15. 0.

This projector can be adapted for 12 volts and 50 volts electricity supplies.

"200-B" with 12 volt motor "200-B" with 50 volt motor £16. 0. 0.



MOUSE FILMS



The Motocamera "B" is fitted with a fully-corrected f/3.5 anastigmat lens. Double claw movement) self-closing shutters.

Strong motor drive throughout a complete length of film, providing over 1,000 pin-sharp single pictures, costing 2/7 per reel, with developing 2/-.

"DE LUXE" MOTOCAMER

with f/2.5 lens and Tele-Attachment. Two lenses for the price of one! The f/2.5 lens admits twice as much light as the f/3.5 lens. By the addition of the Tele-Attachment, which screws on to the front of the existing lens, the image on the film is enlarge four times. Thus long-distance cinematography possible.

£18. 18. 0

With f/2.5. "Hermagis" lens only £16. 16. 0. Tele-Attachment separate - £3. 3. 0.



PATHÉSCOPE 9.5 mm. FILM LIBRARY

In the Pathéscope 9.5 mm. Film Library there is a large and most comprehensive selection of 300 ft. Super films — Comedy, Farce, Drama, Travel, Cartoon and the best of the screen classics by famous producers; in fact, a selection catering for every taste no matter what requirements may be. New films are added regularly to the hundreds and

hundreds already available. The Library Service is available for the hire of Super Films only and membership starts automatically with the purchase of a book of coupons.

All Pathéscope 9.5 mm. films may be purchased outright —30 ft. reels for 3/6, 60 ft. reels for 6/- and 300 ft. Super reels for 27/6.

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559



PHOTOGRAPHIC PAPERS





VITEGAS DE LUXE and VITEGAS (Chloro-Bromide)

The popular chloro-bromide papers giving photographers a medium that does full justice to their negatives and adds distinction to their work. Vitegas De Luxe is a super chloro-bromide paper with rich warm tones and a delicate scale of gradation. Any warm tone developer can be used and it allows photographers to produce any desired tone. Obtainable in two speeds so that enlargements of almost pigment-print quality are as easy to make as contact prints.

Vitegas, the original chloro-bromide, introduced in 1913, also yields attractive warm tones but may be toned by the usual sepia toning methods, such as hypo alum, sulphide, and liver of sulphur. Many attractive surfaces, some of which are also coated with a contrasty emulsion.

VITEGAS DE LUXE. Cream Card—Smooth 314B, Rough 318B (Contact); and Smooth 414B, Rough 418B (Enlarging). Pearl Matt Card, 305B (Contact); 405B Enlarging.

VITEGAS. Card—Glossy 1B and C1B, Velvet 2B, Semi-matt 3B, Pearl Matt 5B and C5B, Cream Semi-matt 6B and C6B, Cream Smooth Matt 7B and C7B, Cream Rough Natural Surface 8B, Cream Silk Grain 11B, White Silk Grain 13B, Ivory Smooth Matt 55B, Ivory White 56B.

Also new Eggshell Grain Card-White 16B, Cream 17B.

C numbers denote "Contrasty" others "Normal." Post Cards supplied in all surfaces and grade on card base.

KOSMOS NOVEX GASLIGHT PAPER

This product of Kosmos has won its place as the leading gaslight paper by reason of its speeds, latitude, and freedom from staining. Economical in use, this popular paper is extensively used by most of the largest D. and P. concerns in all parts of the world. The four grades of contrast give the worker wider scope in his ability to produce really bright prints from the poorest negative, with the added advantage that the sparkling blue-black prints give absolute satisfaction to the most exacting customer. Reliability is the feature which has firmly established Novex as an important factor in up-to-date D. and P. work.

NOVEX. Glossy NOVEX Paper 201A, Glossy NOVEX Card 201B in soft, normal, vigorous, and extra vigorous. Velvet NOVEX Paper 202A, Velvet NOVEX Card 202B, in normal and vigorous only.

Post Cards supplied in both surfaces and grades coated on card base.





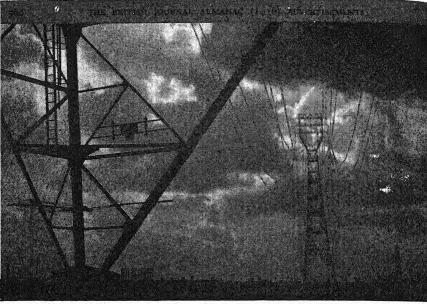


Photo by Noel Griggs, Studio Briggs

KOSMOS BROMIDE

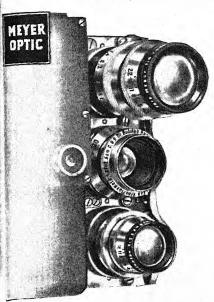
The range of 15 surfaces—some in as many as 5 different grades—fits Kosmos Bromide for every branch of photography. Excellent prints can be obtained from any negative, and the importance of Kosmos Glossy Bromide Paper and Card cannot be too highly recommended for Press and Commercial work. Sepia tones on this paper are attractive, rich in colour and easily obtained. Both paper and card are supplied in ordinary white base and mauve-white base.

KOSMOS BROMIDE. GLOSSY WHITE. Paper 101A, Card 101B (all grades), Extra Rapid Card 101BX (2). Glossy Mauve—Paper 112A (all grades), Card 112B (2, 3, 4, 5). VELVET—Paper 102A (2, 3, 4), Card 102B (1, 2, 3, 4). SEMI-MATT—Paper 103A (2, 3, 4), Card 103B (2, 3, 4, 5). ROUGH NATURAL SURFACE—Card 104B (2, 3). MATT—Paper 105A (2, 3, 4), Card 105B (2, 3, 4). CREAM—Matt Paper 107A (2), Matt Card 107B (2, 3). Cream Rough Natural Surface Card 108B (2, 3). Cream Velvet Card 110B (2, 3). SILK GRAIN CARD—Cream 111B (2, 3), White 113B (2, 3). SMOOTH NATURAL SURFACE Card 114B (2, 3), Cream 115B (2, 3). ROUGH BROMIDE PAPER—140A (2).

The Nos. in brackets are the Grades—No. 1, Soft; No. 2, Normal; No. 3, Vigorous; No. 4, Extra Vigorous; No. 5, Super Vigorous.

There is also Kosmos Bromide Extra Rapid Card for street photography and Kosmos Negative Card for while-you-wait (a la minute) studios.

(CODING DE PARENCE AND ACTUAL DE LA CERTA Primaria de la Companya de la Compa



MEYER LENSES

for CINE and STILL

Professional and Amateur

CONSTRUCTIONAL DESIGNS OF THE FAMOUS MEYER LENSES



Kino-Plasmat 1: 1.5



Primoplan 1: 1.5



Makro-Plasmat 1: 2.7



Trioplan 1: 2.8



Tele-Megor 1: 4 and 1: 5.5



MEYER KINO PLASMAT F1.5

(Patent Dr. Rudolph)

Complete correction for the spectrum.

THE BEST LENS FOR MONOCHROMF AND COLOUR PHOTOGRAPHY

Critical definition with perfect perspective.

FOR THE BEST COLOUR FILMS USE A PLASMAT

| Focus | | | Foo | uss lour | |
|--------|-----|---|-----|-------------|----|
| inches | mm. | (Wide Angle), for 16 mm. Cine film Cameras and 8 mm. | £ | s. | d. |
| 16 | 15 | Cine Nizo | 15 | 0 | 0 |
| 4 | 20 | For 16 mm. and 9.5 mm. (Pathe de Luxe) Cine film Cameras | 15 | 0 | 0 |
| 1 | 25 | For 16 mm. and 9.5 mm. Cine film Cameras, Siemens D, etc | 18 | 2 | 6 |
| 1 g | 42 | For standard professional film | 24 | ō | ŏ |
| 2 | 50 | For standard professional film and as Telephoto lens for 16 mm. Cameras | 26 | 5 | 0 |

ALL PRICES INCLUSIVE FITTING



MEYER PRIMOPLAN FL.5

NEW FIVE LENS CONSTRUCTION (Two cemented elements)

EXCELLENT DEFINITION GREAT SPEED

Correction over a field angle 40 degrees.

| Fo | cus | | Foc | ussi loun | |
|-------------------|-----------|---|---------------|----------------|--------------|
| inches I 3½ | mm. 25 | For 16 mm, and 9.5 mm. Cine film Cameras F/1.9. For Exakta Camera | £ 14 20 | S. 10 18 | d. 0 0 |

Sole Distributor A. O. ROTH



MEYER TRIOPLAN ANASTIGMAT F2.8

Special Cine Three Lens Construction EXCELLENT CORRECTION PERFECT DEFINITION

At full aperture AND SMALL STOPS

| Focus | | 4 | | cuss Loui | | | oc | |
|--------|-----|---|----|--------------|----|---|----|----|
| inches | mm. | | £ | s. | d. | £ | s. | d. |
| 18 | 15 | Wide Angle, for 16 mm. Cine Film Cameras and Cine Nizo 8 mm | 8 | 4 | 0 | 5 | 0 | 0 |
| 3 | 20 | For 16 mm. and 9.5 mm. Cine Cameras | 8 | 4 | 0 | 5 | 0 | 0 |
| I | 25 | For 16 mm. and 9.5 mm. Cine Cameras | 8 | 4 | 0 | 5 | 0 | 0 |
| 2 | 50 | For 16 mm. and 9.5 mm. Cine Cameras as TELEPHOTO LENS | 9 | 15 | 0 | | _ | |
| 3 | 75 | For 16 mm. and 9.5 mm. Cine Cameras as TELEPHOTO LENS | 11 | 5 | 0 | | | |
| 4 | 100 | For 16 mm. and 9.5 mm. Cine Cameras as TELEPHOTO LENS | 13 | 0 | 0 | | | |

ADAPTATION AND TELEPHOTO FINDERS EXTRA



MEYER KINON SUPERIOR FI.6

PROJECTION

Perfect Screen Definition
BRILLIANT ILLUMINATION
NO STRAY LIGHT

Definitely the BEST Projection Anastigmat

| | | | FRI | CES | | | |
|---------------|--|----------------|--|--|--|--|---|
| For: Focus | 200 B. Pathe or De Luxe Model | Bell Howell | Victor | Siemens | Bolex all models | Ensign | Kodak* |
| inches 1 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 | 5 5 0 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 | £ s. d. 5 5 0 5 5 0 5 5 0 5 10 0 5 15 0 |
| <u> </u> | 12 0 M | | e Angle P | lasmat F 12 0 0 | /1.5 12 0 0 | 12 0 0 | 12 0 0 |

FOR BEHIND SCREEN PROJECTION OR WHERE AN ENORMOUS PICTURE IS REQUIRED AT SHORT THROW.

*In cases where Projectors need special adapters for the Meyer Kinon Superior Lens to be mounted, an extra charge is made for the adapter—according to the amount of work entailed

Telephone Hither Green 2424 85 Ringstead Rd., LONDON S.E.6



MEYER DOUBLE PLASMAT F/4

(Patent Dr. Rudolph)

COMBINABLE

Full Correction for the Spectrum for COLOUR and MONOCHROME

Foci 21 to 19"

PRICES

| Combined | Single | Standard | Sunk | Plate Covered | Code Word |
|---|------------------------------|--|--|--|---|
| Focus | Component | Mount | Mount | at Full Aperture | Std. Mt. Sunk Mt. |
| inches 3 1 4 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | inches 6 6 7 7 8 8 9 10 8 12 | £ s. d. 14 7 6 15 0 0 16 17 6 18 15 0 20 0 0 20 12 6 26 5 0 | £ s. d. 15 0 0 15 12 6 17 10 0 19 7 6 20 12 6 21 17 6 27 10 0 | inches 34 × 28 34 × 34 44 × 34 44 × 34 44 × 34 51 × 4 6 × 4 | Pacos Pardel Paddy Pardo Padua Pari Paga Parnon Page Pagina Pagus Pascha Pagus Papius |

PLASMAT SET F4.5 (3 foci) Prices on application

DOUBLE PLASMAT F5.5 Prices on application



MEYER TRIOPLAN

Series F/3-F3.8

The Supreme Speedy Anastigmat for MODERN PORTRAITURE

Wonderful life-like modelling

COMMERCIAL.

FASHIONS——STUDIO

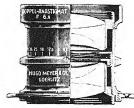
PRICES

| Focus | Standard | Square | Suitable | Code | Silent Central |
|--|--|---|--|--|--|
| | Mount | Flange | for | Word | Shutter for Front |
| inches 101 12 14 161 19 | £ s, d. 31 5 0 36 5 0 50 0 0 72 10 0 87 10 0 | £ s. d. 0 15 0 1 0 0 1 5 0 1 10 0 1 15 0 | inches 7 × 5 8½ × 6½ 8½ × 6½ 10 × 8 10 × 8 | Watt Wage Wagner Walkure Waffe | £ s. d. 4 5 0 4 17 6 5 12 6 7 0 0 8 2 6 |

Foci from 10½" to 16½" can be supplied with automatic soft focus mechanical adjustment, £7 10 0 extra

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In Foci from 18" to 30"

Meyer Double Anastigmat F6.8

COMBINABLE

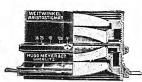
For Commercial Photography of every description

FREE FROM FLARE

High Degree of Colour Correction

PRICES

| Focus inches | Standard Mount | Sunk Mount | Covers inches | Code Standard Mount | Word Sunk Mount |
|--------------------------------------|---|-----------------------|---|---|----------------------------------|
| 6 1 8 2 3 3 4 10 2 14 16 19 2 2 4 30 | £ s. d. 10 12 6 17 10 0 25 0 0 31 5 0 38 2 6 50 0 0 65 0 0 87 10 0 118 15 0 | £ s. d. 11 5 0 18 2 6 | $\begin{array}{c} 6\frac{1}{2} \times 4^{\frac{3}{4}} \\ 8\frac{1}{2} \times 6^{\frac{1}{2}} \\ 10^{\frac{3}{4}} \times 8\frac{1}{2} \\ 12 \times 10 \\ 14 \times 12 \\ 16 \times 12 \\ 17^{\frac{1}{2}} \times 16 \\ 24 \times 20 \\ 28 \times 22 \end{array}$ | Vaida Vallid Vampir Vanad Vanloo Vapeur Varazze Valpo Varde | Dank Darm — — — — |



In Foci from 31" to 103"

Meyer Wide Angle Aristostigmat F6.3

Angle 105 degrees

THE MOST SPEEDY WIDE ANGLE
LENS WITHOUT FLARE

PRICES

| Equiv- At fu | | Standard Mount | Vario- Shutter | Ibsor Shutter | Compur Shutter | Adap- ter |
|---|--|--|---|---|--|-------------------|
| Focus ins. | aper- ture | £ s. d. Code | | £ s. d. Code Word | £ s. d. Code Word | Ring s. d. |
| 3 t 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 | $4^{\frac{3}{4}} \times 3^{\frac{1}{2}}$ 6 × 4 7 × 5 | 6 15 0 Zirpe 7 3 9 Zicke 7 10 0 Zirkel | 8 5 0 Wabe 8 13 9 Wache 9 0 0 Wachtel | 10 10 0 Wallone 10 18 9 Walnut 11 5 0 Walze | | 6 3 6 3 6 3 |
| 5‡ 6‡ 7 | 8½×6½ 9 ×7 10×8 | 8 5 0 Zimme 9 15 0 Ziege 12 0 0 Ziel | 9 15 0 Waffel 11 13 9 Wahl | 12 00 Wange 14 50 Wanne 16 10 0 Warte | 13 10 0 Wimpe 15 15 0 Winkel 18 0 0 Winzer | 6363 |

Our well-known F/9 Series are still obtainable at above prices

Telephone Hither Green 2424 85 Ringstead Rd., LONDON S.E.6



Meyer Helioplan Anastigmat F4.5

Four lens system for ENLARGING

Even definition to the edges. No falling off

In Foci from 21" to 10" In Standard Iris Mount

FREE FROM DISTORTION. FLARE AND COLOUR DEFECTS

PRICES

| Focus | Negati | ve Size | Code Word | Price Focus | | Negative Size | | Code Word | F | ric | e | | |
|-------------------------|---|---|--|-------------|----------------------------------|------------------------|--------------------------------|--|----------------------|-----------|--------------------|----|-------|
| inches 21 21 3 31 42 42 | 24 × 36mm. 3× 4 6× 6 6× 6 6× 9 | 11×11 28×28 28×28 28×28 31×21 | Helena Helena Helenin Heliade Heliand Heliast | 5 5 5 | s. 12 12 12 18 18 | d. 0 0 0 0 | 51 6 62 7 81 10 | 9 × 12 10 × 15 10 × 15 13 × 18 13 × 18 | 6 ×4 6 ×4 7 ×5 | Heliotrop | 6 7 10 12 | 10 | 0 0 0 |

MEYER "ZEROS" RANGE FINDER

Quick and sure in action

Brilliant secondary image

£2 5 0

MEYER "MEGOFLEX"

Reflex attachment for Leica and Contax Cameras

£5 15 0

MEYER LIGHT FILTERS

Finest Optical Jena Glass

In all sizes and mounts

MEYER SUPPLEMENTARY LENSES

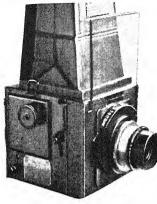
FOR CLOSE-UP WORK

FOR DISTANCE WORK

For fixed focus cameras or those with short extension

Sole A. O. ROTH

Telegrams



Roth Superspeed Combined Press and Reflex Camera

 9×12 cm. Measurements $6''\times 6\frac{1}{4}''\times 5\frac{1}{2}''$. Weight approx. I lb. 3 ozs. without lens. Silent, quick wind, self-capping focal plane shutter, speeds 1/1000th to 1/5th. T. and B. Direct vision frame finder.

PATENT TOP SCALING

Lever adjustment for eye level use without mirror action.

IDEAL FOR AERIAL PHOTOGRAPHY. NO BELLOWS

General Press Work. Animal Photographs.

This Camera can also be supplied in $3\frac{1}{2}'' \times 2\frac{1}{2}''$ size. Price on application.

| PRICES (Professional. Not subject to Commission): | | | | | | | | | | | |
|---|-----|--------|---------|--------|----------|-------|----|----|---|--|--|
| Fitted Meyer F/3 Anastigmat focu | | | | | | ••• | 48 | 0 | 0 | | |
| Fitted Meyer F/4.5 Anastigmat OR | | Tessar | F/4.5 a | nd six | single s | lides | 38 | 0 | 0 | | |
| Synchronisation for electric flash b | ulb | ••• | ••• | ••• | | | 8 | 0 | 0 | | |
| Extra Single Slides | ••• | | | ••• | | • • • | 0 | 4 | 6 | | |
| Film Pack Adapter | ••• | | | ••• | | | 0 | 18 | 6 | | |
| Lens Hood | | ••• | ••• | ••• | *** | | 0 | 18 | 6 | | |
| Filter, Jena glass optically worked | ••• | | | | ••• | | 1 | 14 | 0 | | |



Roth Superspeed Press Focal Plane Camera

9 × 12 cm. ONLY. Measurements $5\frac{1}{2}$ " × $6\frac{3}{2}$ " × $2\frac{3}{2}$ ". Weight approx. 1 lb. 4 ozs. without lens.

STRONG DURABLE CONSTRUCTION

Silent, quick wind, non-capping focal plane shutter (OR Self-capping shutter).

Speeds 1/1000th to 1/5th. T. and B.

Extra strong quick-erecting struts. Weather resisting leather bellows. Brilliant Finder and Direct Vision Frame Finder.

PATENT TOP SCALING Horizontal and Vertical Tripod Bush.

| PRICES ROTH PRESS SUP | | | | | | | | | £ | s. | d. |
|-------------------------------------|-----------|--------|---------|-------|-----|-----|-----|------|----|----|-----|
| mat Lens focus 6". | | | | | | | | | 51 | 5 | 0 |
| Ditto, fitted M | | Anas | tigmat | ••• | ••• | ••• | ••• | | 40 | 3 | 0 |
| Extra Double Dark S | | | | | ••• | ••• | | each | 2 | | , Ŏ |
| Automatic Changing | | h twei | ve She | aths | ••• | ••• | ••• | *** | ž | 18 | Ü |
| Film Pack Adapter Deep Lens Hood | ••• | ••• | ••• | ••• | ••• | ••• | ••• | | | 18 | ž |
| Single Metal Slides | | | ••• | ••• | | | ••• | each | ŏ | 4 | 6 |
| Adapter for Single S | | | | | | | | | 2 | 0 | 0 |
| Cowhide Leather Cas | e, velvet | lined. | to take | camer | | | | | 2 | 15 | 0 |
| Synchronisation for e | lectric f | ash bi | ılb | | | | | | 8 | 0 | 0 |
| Special Size Cases | Made | to O | rder. | | | | | | | | |

Telephone Hither Green 85 Ringstead Rd., LONDON S.E.6



PATHÉ DE LUXE MOTOCAMERA

30 ft. Charger

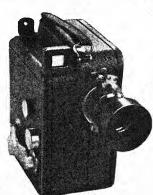
With MEYER PLASMAT F/1.5, focus 3 (20 mm.) in interchangeable focussing mount. Scaled in feet, infinity-2 feet. Depth-of-focus scale, showing accurately the depth of focus at various distances with the different stops. Variable speeds. Automatic optical eye-level and waist level finders.

Complete ... Without automatic finders

Meyer Telephoto Anastigmat F/4.5 focus 2", with optical finder, extra 10 10 Meyer Telephoto Anastigmat F/2.8 focus 2", with optical finder, extra 16

CONVERSION OF CLIENT'S OWN CAM-ERA INTO AN INTERCHANGEABLE LENS MODEL.

PRICE ON APPLICATION



Cine Nizo-Motor Spring Driven Cine Camera

30 ft. Charger. 9.5 mm.

Interchangeable bayonet lens mount. Variable Speeds, 16-32 frames per second. Hand drive. One frame per turn for titles and trick films. Easy loading. Strong, durable construction. Smooth running.

PRICES Fitted Meyer F/2.8 Anastigmat, focus 1", fixed focus Fitted Meyer F/2.8 Anastigmat, focus
1" in interchangeable focussing mount 18 15 0

Fitted Meyer F/1.5 Plasmat focus 1", in interchangeable focussing mount ... 26 15 0 50 ft. Compact Model Cine Nizo Prices on application





PRISM PERISCOPE **FOCUSSING MAGNIFIER**

Precision Optical Prism. Precision Aplanatic Eyepiece Slides into the gate of Cine Cameras. Used for ascertaining correct focus and field. Indispensable for titling and close-up work.

State make of camera when ordering. For 9.5 mm. Cine Cameras 16 mm. Cine Cameras

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ARGUS CINE CAMERA

100 ft. or 50 ft. 9.5 mm. Film. Easy Loading. Compact and Solid, combined with Great Precision.

Die cast body. Continuous sprocket feed. Speeds 12-64 per second. Ball race spindles. SILENT AND SMOOTH.

Spring Power Forward and Reverse Drive Single frames in any position without fogging. Spring wind tension dial, showing the amount of tension on power spring. Waist level and eye level optical finders.

Precision Revolving Turret Head.

| PRICES, inclusive Best Quality Leather Case | £. | s. | d٠ |
|--|----|----|----|
| PRICES, inclusive Best Quality Leather Case Fitted Meyer F/2.8 Ansatigmat focus I" in interchangeable focussing mount Fitted Meyer Planet F/7 focusing mount | 30 | 10 | 0 |
| Fitted Meyer Plasmat F/1.5 focus 15 mm. OR 20 mm. in interchangeable | | | |
| focussing mount | | 10 | |
| Fitted Meyer Plasmat F/1.5 focus I" in interchangeable focussing mount | 43 | 8 | 0 |
| Meyer Telephoto Anastigmat F/2.8 focus 2" extra | 9 | 15 | 0 |
| All other foci can be fitted as per list. | | | |



Compact Pocket De Luxe Cine Camera—9.5 mm.

30 ft. Charger. Dimensions only 6½"×3½"×1½" thick. Weight 2½ lbs:

Precision Throughout. Fine Finish Smooth, quick wind, spring motor. Automatic footage

Direct and Right Angle Optical Finders. Interchangeable lens fitting

| PRICES | £ | 8. | đ. |
|---|----|----|----|
| Fitted Meyer F/2.8 Anastigmat focus 1", | | | |
| fixed focus | 21 | 0 | 0 |
| Fitted Meyer F/2.8 Anastigmat focus I" in | | | |
| interchangeable focussing mount | 24 | 0 | 0 |
| Fitted Meyer F/1.5 Plasmat focus 1" in | | | |
| interchangeable focussing mount | 30 | 0 | 0 |
| Telephoto Lenses as per list. | | | |



Paillard Turret Head Cine Camera

Model H.16 for 16mm. Films. Model H.9 for 9.5 mm. Films. Takes 100 ft. or 50 ft. Reels
Semi-automatic loading. Continuous sprocket feed. Speeds Semi-automatic loading. Continuous sprocket feed. Speeds 8-64 per second, constant and reliable. Single frames with various exposure from I/10-I/100th, automatic and Time. Forward and reverse action. Reverse action possible for the whole 100 ft. Footage indicator (automatic) for forward and reverse. Rapid rewind of motor spring. Perfect claw mechanism with precision gate. Special steel spindles running in bronze bearings. Specially constructed optical tri-focal finder with prefailax correction was to 1 feet. with parallax correction up to 11 feet.

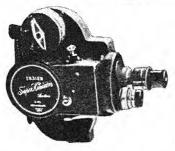
PRICES
Fitted Meyer F/2.8 Anastigmat, focus I" in interchangeable focussing mount
Fitted Meyer Plasmat F/1.5 focus 15mm. OR 20mm. focus, in interchange-

able focussing mount Fitted Meyer Plasmat F/1.5 focus 1" in interchangeable focussing mount

Telephoto and Other Lenses as per list.

Telephone Hither Green 2424

85 Ringstead Rd., LONDON S.E.6



ENSIGN KINECAM 16 mm. Cine Camera

For 100 ft. or 50 ft. Reels.

MODEL 6. Double spring motor. Hand turn movement for reverse. Tubular and direct vision Parallax Finders. Three speeds. Single exposure device.

PRICES

Fitted Meyer F/2.8 Anastigmat, focus I" in focussing mount ... MODEL 8. Super Kinecam Turret Head. 5 speeds, 8, 12, 16, 32, 64. Sprocket feed, easy load, precision gate. Hand turn reverse.

PRICE Fitted Meyer Plasmat F/1.5 focus 1° in interchangeable focussing mount 60
Telephoto and other Lenses as per list.



Bell & Howell FII MO Model 70 DA Cine Camera Turret Head (Three Lenses)

16 mm. 100 ft. Seven speeds. Variable Finder. Critical focusser.

All Refinements for Modern Movie-Making

PRICE £ s. d.

Fitted Meyer Plasmat F/1.5 focus 1" in interchangeable focussing mount, including first-class leather case ...

91 0 0

Telephoto Lenses as per list.



Bell & Howell FILMO Straight Eight Cine Camera

8 mm. 30 ft. Dimensions 5" × 3" × 1". Weight 24 ozs.

A HANDFUL OF PRECISION

Easy loading. Exposure Calculator. Variable view finder for standard focus 1" and 1½". Four speeds, 8, 16, 24, 32. Interchangeable lens fitting.

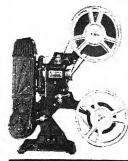
£. s. d.

Fitted with standard lens F/2.5 ... Fitted Meyer Plasmat F/1.5 focus 15 mm. in interchangeable focussing mount ... Telephoto Lens. Meyer Plasmat F/1.5 focus 1" in interchangeable focussing mount ...

18 2 6

Sole Distributor A.O. ROTH Mentorflex Catgreen

Telegrams London"

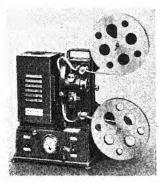


PATHÉ 200B PROJECTOR

With MEYER KINON SUPERIOR F/I.6, Focus 15"

The most reliable Home Projector, with maximum illumination and perfect definition at a moderate price. All Facilities. Tilting, Fan-cooled, rewind of film. Easy load. Sprocket feed. 400-ft. Reels.

| | P | RICE | | £ | s. | d٠ |
|--|--------|-------|-----|---|----|-------------|
| COMPLETE SUPERIOR Resistance Transformer (When order | F/1.6, | focus | 18" | | 15 | 0 0 6 |



New Universal Projector (400 ft. Reels)

Dimensions 11" × 8" × 13½".

Interchangeable 16 mm, 9.5 mm. and 8 mm. Change over of size in a second.

Double Claw. Three complete interchangeable mechanisms. Dual Motor Drive (Projector and Fan). Separate controls, drive, speeds, light switch, etc. Extra strong construction, yet compact. Safety shutter for stills. Easy manipulation.

PRICES

£ s. d.

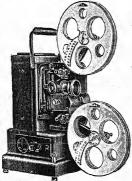
With MEYER KINON SUPER-IOR PROJECTION ANASTIG-MAT F/1.6, with focussing adjustment, focus 1\(\frac{6}{2}\). Complete with one size mechanism ... 44 0

Extra mechanisms for either size 15 10

Lamps, 250-500 each £1 13 0 to 2 10

Neostar Resistance ... 5 10

Carrying Case for Projector ... 3 10



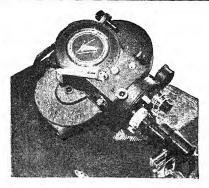
PAILLARD BOLEX PROJECTOR

G3. 500 W.

8 mm., 9.5 mm. and 16 mm. Automatic rewind. Safety Shutter for stills.

| Safety Structer for stries. | | | |
|---|----|----|----|
| PRICES | £ | s. | d. |
| Fitted MEYER KINON SUPERIOR F/1.6, focus 2" Special MEYER Eccentric Lens, focus | 60 | 0 | 0 |
| 20 mm. for projection of 8 mm. films | 4 | 0 | 0 |
| Resistance | 2 | 10 | 0 |
| | | | |

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Victor Model V Cine Camera

16 mm. 100 ft. 3 Lens Turret Head. 5 speeds: 8, 16, 24, 32, 64. Forward and reverse action. Automatic footage indicator. Variable field finder, with parallax adjustment. Visual focussing. Precision throughout.

PRICES Fitted Meyer Plasmat F/1.5, focus 1", in interchangeable focussing mount 68 0 0 Fitted Standard Lens F/2.9, focus 1" ... Telephoto Lenses as per list.



ROTH UNIPOD

Compact. Light. Solid.

A real steady support from the ground or with the chest strap support. For Cine and Miniature Cameras

PRICES

Size I. Closed 10 in., extended 4 ft. 3 ins. Including Size II. Closed 13 ins., extended 5 ft. Including strap 17 6

With Standard English Thread.

Continental Congress Thread, extra 1/-

THE FINEST SERVICE STATION FOR THE REPAIR OF

ALL HIGH CLASS APPARATUS FITTING OF LENSES MAKING UP OF SPECIAL APPARATUS TO SPECIFICATION

FREE ADVICE AND ESTIMATES. ALL MAKES OF HIGH CLASS CINE APPARATUS SUPPLIED

Sole Distributor A. O. ROTH

Telegrams "Mentorflex Catgreen

s. d.





THE CAMERAS
WITH
WORLD-WIDE
REPUTATION

REFLEX CAMERAS

For the Professional. Studio or Commercial.

For the Pressman and Sports Photographer.

For the Amateur Photographer.

For Science—Mineralogical—Botanical—Chemical Research.

For Industrial Photographic Laboratories.

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ARGENTINA: Felix Jaffe, Victoria 978, Buenos Aires.

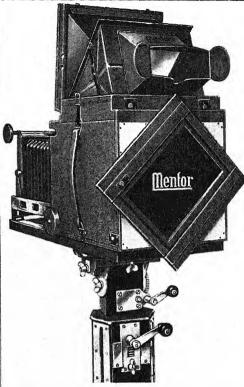
SOUTH AFRICA & RHODESIA: South African Camera House, Port Elizabeth.

TURKEY: C. Frohlich Nachf. W. Edm. Ruff & Co., Istanbul.

SIAM: Diethelm & Co., Bangkok.

INDIA: U Tha Nyein & Sons, Janwi, Burma. JAPAN: Honjo & Co., Kobe, Filiale, Tokio.

MENTOR CAMERA WORKS, DRESDEN, 50



MENTOR STUDIO REFLEX

The most efficient instrument for modern portraiture.

Camera front provided with tilt and swing adjustments in both directions, actuated by micro-worm pinion screw.

Second focussing hood changeable for eye level observation with an additional optically worked mirror.

Long extension actuated by strong rack and pinion, exceedingly smooth working and dead rigid.

Fronts Extra Strong to carry large and heavy lenses.

The modern large aperture lens can only be successfully used without stopping down

with the aid of swing and tilt actions. There is no need to stop down, thereby getting the full benefit of the speed of the modern lens.

| Sizes in inches | $2\frac{1}{2} \times 3\frac{1}{2}$ 6, 5 × 9 | 3½×4½ 9×12 | $\begin{array}{c} 3\frac{1}{2} \times 5\frac{1}{2} \\ 10 \times 15 \end{array}$ | $4\frac{3}{4} \times 6\frac{1}{2}$ 12 × 16,5 | 5×7 13×18 | 5×7 13×18 |
|--|--|----------------------|---|---|----------------------|--------------|
| Extension in inches min. max. | 63 114 | 8 3 14 | 9 7 17 | 9 7 17 | 9 7 17 | 117 21½ |
| Price with 3 Double Dark Slides, Strap and Cable Release. Without Lens | £47 10 | £50 | £57 10 | £62 10 | £62 10 | £75 |

Studio Tripod. Exceedingly strong. Black polished with nickel-plated fittings. Double rack and pinion motion, with crank for vertical adjustment. Tripod head extra large.

Worm screw adjustment for tilting actuated by crank. £11 13 4.

PRICES QUOTED EX WORKS.

MENTOR CAMERA WORKS, DRESDEN, 50

577



NEW 1936 MENTORETT

 6×6 cm.

12 Exposure Roll Film Reflex

Takes standard $2\frac{1}{4} \times 3\frac{1}{4}$ Roll films

PRECISION FOCAL PLANE SHUTTER

Full speeded to 1/600th second. Automatic film exposure number check.

COUPLED IRIS DIAPHRAGMS FOR BOTH LENSES.

FILM TRANSPORT, SHUTTER SETTING and RELEASE, by ONE ACTION ONLY.

DOUBLE EXPOSURES IMPOSSIBLE.

Always ready for exposure in ever-ready leather case. Price, including High Class f/3.5 Anastigmat Focus 3 ins.

£15 0 0

A MASTERPIECE OF CAMERA CONSTRUCTION.

Light and Compact, combined with Stability and Precision.

Prices quoted ex Works.

MENTOR CAMERA WORKS, DRESDEN, 50



MENTOR STANDARD REFLEX

Self-capping, quick wind, silent focal plane shutter.

Speeds 1/5th-1/1500th. B & T.

Automatic coupled masking with revolving back of top and back screens.

Prices Quoted ex Works.

| Sizes in inches | $\begin{array}{c} 2\frac{1}{2} \times 3\frac{1}{2} \\ 6, 5 \times 9 \end{array}$ | $\begin{array}{c c} 3\frac{1}{4} \times 4\frac{1}{4} \\ 9 \times 12 \end{array}$ | $\begin{array}{c} 3\frac{1}{2}\times5\frac{1}{2} \\ 10\times15 \end{array}$ | 5×7 13×18 | 5×7 13×18 | 5×7 13×18 |
|---|--|--|---|--------------|--------------|--------------|
| Extensions in m/m min. max. | 130 192 | 175 300 | 205 350 | 215 360 | 245 450 | 300 550 |
| Price with 3 Double Dark Slides, Strap and Cable Release, without | | Nr. 203 | Nr. 204 | Nr. 208 | Nr. 210 | Nr. 210a |
| Lens | £30 | £33 6 8 | £38 6 8 | £43 6 8 | £48 6 8 | £56 13 4 |



MENTOR COMPUR REFLEX

The smallest and latest $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Precision Reflex. For Plates, Film Packs and Roll Films.

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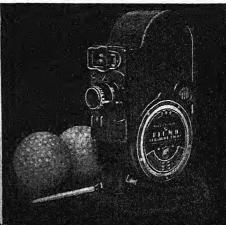
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COMPANY LIMITED.

The World's Largest Manufacturers of Cinematograph Cameras and Cine Equipment

FILMO "STRAIGHT 8" CAMERA

The smallest cine camera in the world. Simple to use, easy to carry. Foolproof daylight loading. Easy threading. An alarm sounds when 30 ft. of film have been exposed and footage dial automatically resets. Four speeds, brilliant viewfinder, and built in exposure chart. Fitted with 12.5 mm. TT.H. F/2.5 lens as standard equipment and everready auxiliary mattes for two other focal length lenses. Other lenses easily interchangeable include 1 in. T.T.H. F/2.7 and 1½ in. T.T.H. F/3.5.



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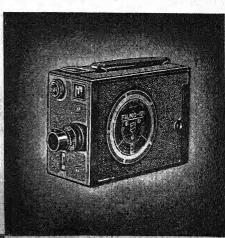
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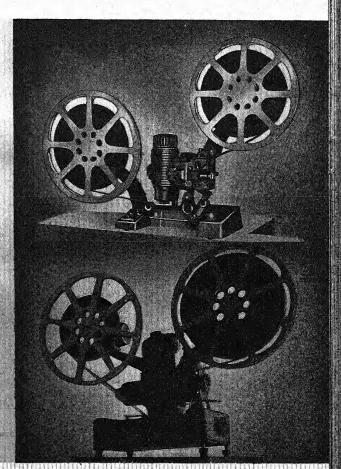
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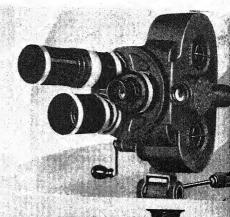
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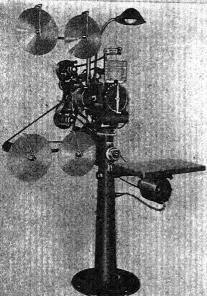
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The first marketed 'chrome' film still leads in quality and reliability. Possessing a high degree of latitude it is easy to obtain first-class pictures in fine weather as well as in dull and fading evening light.

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Superseding the Superpan emulsion this remarkable panchromatic film is unequalled for instantaneous exposures under half watt lighting in the home, for snapshots in theatres during performances and in the streets at night. Gives true colour rendering and is absolutely non-halative.



AGFACOLOR ULTRA FILMS—give transparencies in natural colours. The speed of these films makes instantaneous exposures in daylight possible, without the use of filters.



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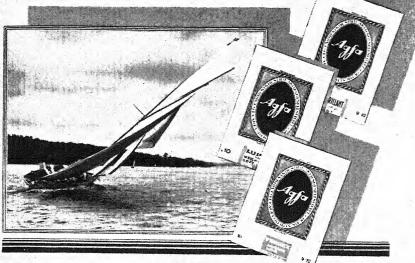
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A printing paper giving green tones by direct development.

Specially suitable for subjects such as pictures of fields and woods, of the sea, lakes and rivers where natural greens are predominant.

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PANCHROMATIC

for general out-of-door shots. Extreme latitude: correct tone values: anti-halative.



Superseding Novopan, this high speed film is ideal for exposures under artificial lighting and out-of-doors in dull weather and poor conditions.

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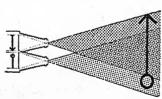


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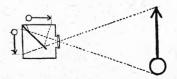


Exakta Reflex Camera

Notwithstanding the small size of the body of this camera, pictures made on V.P. films, standard size, are very effective and large enough to give complete satisfaction. The picture shown on the ground glass is identical with the photograph to be taken. Pictures will always be sharp, as focussing and depth of focus can be easily controlled on the ground glass. It is impossible to take two pictures on one film, as the changing of the film from number to number automatically sets the shutter, therefore "Exakta" is always ready for use.



This is parallax



"Exakta" is free from parallax

SOME PRINCIPAL ADVANTAGES:

FREE FROM PARALLAX

Only a mirror-reflected image as produced by the "Exakta" lens is always reliable and absolutely coincides with the final picture. Has it not happened to you, in spite of accurate observation through the finder, that, especially in close-up pictures, the body of a person was taken minus the head? No matter whether view finder was built into the camera or attached to it. Such failures are due to a separate finder and taking lens, and is called the parallax. The two diagrams will convince you of the superiority of the "Exakta" camera in this respect.

ALWAYS SHARP PICTURES

Working with a mirror reflex camera is the acme of perfection. No estimating of distances, no time-consuming control of distance meters and tables! No trifling little image in a view finder!

The large reflected image reduces the work of adjusting the diaphragm and the focussing to almost automatic operations. By means of a precision helical mount, focussing to correct sharpness takes place with microscopic accuracy. A magnifier in the hood may further be relied on in case of ultra-critical focussing.

A WONDERFUL SHUTTER

A high-grade camera requires a first-class shutter. The self-capping focal plane shutter, on which the speeds can be easily read, makes instantaneous exposures from 1/25th to 1/1000th second, as well as time exposures of 1/10, 1 2, 1 to 12 seconds without delayed action release and exposures from 1 1000th to 6 seconds when the delayed action release is used. The Exakta focal plane shutter is reliable and precise and is more efficient than the usual shutters. Whether you wish to take a picture of everyday life, of a moving car or aeroplane or of a sporting or similar high speed event, your "Exakta" will not fail you!

A UNIVERSAL REFLEX FINDER

The finder hood is constructed to use the "Exakta" as a reflex or as an ordinary sports camera. By pressing lightly on a lever the finder hood springs open into the "open" position. It is also possible to see the ground glass screen while using the camera at eye level by means of a mirror in the light hood. By pressing down this mirror the light hood is changed into an ordinary and very exact frame finder.

INTERCHANGEABLE LENSES

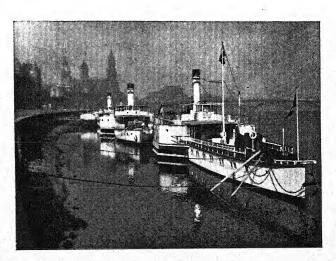
An "Exakta" is remarkably efficient in every way, a real universal camera. There is not a sphere in which its numerous advantages cannot be utilised, including landscape or portrait work, scientific sport, night and stage photography. Various interchangeable lenses of high quality can be supplied and the lenses can be changed in a very simple way even whilst the camera is loaded. For night, interior or stage work an "Exakta" with the largest aperture lens obtainable should be used.

FLEGANT AND PRACTICAL

The beautiful form of the "Exakta" attracts at once. Its handy body lies conveniently in your hand during the tak-

ing of a picture. The elegant trapezoid form is not only beautiful but ensures the utmost utilisation of space. Provided with reflex mirror, focal plane shutter and the most rapid lens, the "Exakta" nevertheless appears to be hardly larger than an ordinary roll film camera.

It is most beautifully made, entirely of metal, leather covered, and fitted with Tripod Bush and Cable Release. Size overall, 6 × 3 × 2\frac{3}{2} ins. Weight 26 ozs.



EXAKTA FOR ALL PURPOSES

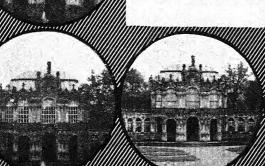
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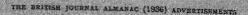
INTERCHANGEABLE LENSES FOR ALL PHOTOGRAPHIC PURPOSES



Lenses of various focal distances for landscapes, portrait work, telephoto and wide angle photography and scientific work. Lenses of very large aperture to f/1.9.

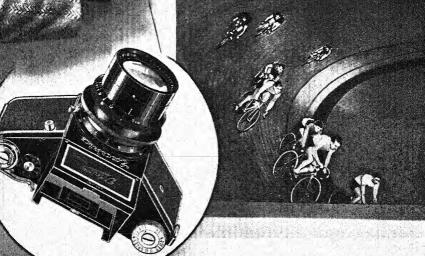


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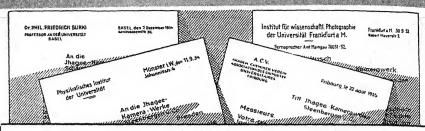


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IHAGEE CDRESDEN



Exakta and World Opinion

Physikalisches Institut

der Universitat-Munster Sept. 11th, 1934

After having your new reflex camera in my possession for about two months, I am now able to let you know my opinion about this beautiful achievement of technics. I must say that this camera does much more that I expected at first. Although I already possessed a well-known miniature camera, I supposed a reflex camera could be of somewhat greater use for my scientific work and I intended to use the miniature camera for all other photographic purposes.

After a short time it appeared to me that I had been in error. The man who uses the "Exakta" would never use or choose something else again. It is a matter of fact that the mirror construction of the Exakta represents the ideal finder. It is simply impossible to make a mistake, to obtain unsharp pictures or undesired views. And I believe that I may say that many amateurs lose the pleasure of photography due to the imperfections of his camera. Moreover, the Exakta is provided with a perfect lens and a focal plane shutter, known as the best shutter.

Finally, I must say that this camera is simply beautiful. The man who desires to obtain really good pictures which will give him complete satisfaction must take the Exakta. No matter under what circumstances pictures have to be taken, my Exakta never left me in the lurch. Well, you need not think this to be exaggerated praise, it is my sure conviction and your camera will find its way. The Exakta is the camera for intellectual men.

With my best wishes for your success, (Signed) HEINZ MENTRUP, Assistant.

Institute for Scientific Photography of the University at Frankfort-on-the-Main.

Sept. 30th, 1933.

The Ihagee reflex camera "Exakta" No. 408521 with Exaktar lens F/3.5, focal length 70 mm., which has been sent to us on our request, has been thoroughly tested in the abovementioned Institute for Scientific Photography. The test included the optical equipment, the construction and the range of usefulness. The result of this examination is given below:

The perfectly corrected lens (compare picture No. 1), in conjunction with the possibility to focus very exactly by means of a magnifier, permits a rapid and precise focussing on the ground glass, which corresponds completely with the focus of the film (pictures 2-5). It is worth mentioning that the film lays perfectly flat in the focus by means of a new construction and this, combined with the focal plane shutter, which works free of vibration, guarantees pic-tures of equal sharpness. Test pictures 6-11 prove that even after many days the film in the camera, ready for use, remained in its position. This new construction of the Ihagee Camera Works removes all prejudices to the present miniature camera, such as too small negatives, too many exposures on one film, separated finder and camera lens, parallax, etc., whilst all the advantages of the miniature cameras, such as quickness in operating, ever sharp pictures, impossibility of double exposures, light weight and handy shape, are incorporated in the Exakta in the most perfect manner.

(Signed) DR. A. BUSCH.



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FRANKE & HEIDECKE, Salzdahlumerstrasse, 196 BRUNSWICK, GERMANY





This popular twin-lens reflex is by the same manufacturers as the Rolleiflex, and has many features in common with that famous camera. It shows your picture full size and right way up on the ground glass screen, has separate finder lens giving full parallax compensation and is fitted with one-lever Compur Shutter speeded to 1/300th sec, T. & B. Rolleicord takes 12 pictures on 8 exp. $3\frac{1}{4} \times 2\frac{1}{4}$ roll-film for 1/-.

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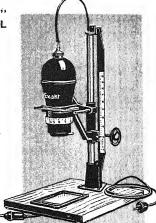
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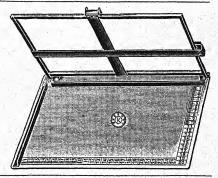
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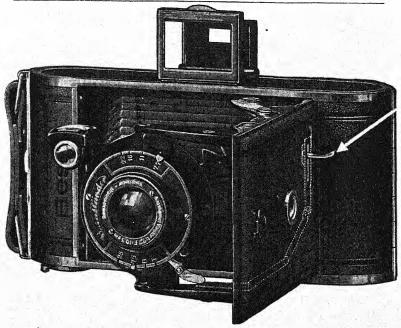
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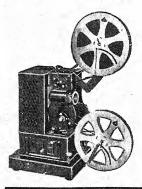
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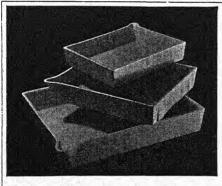
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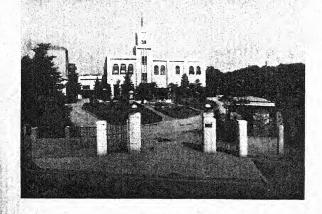
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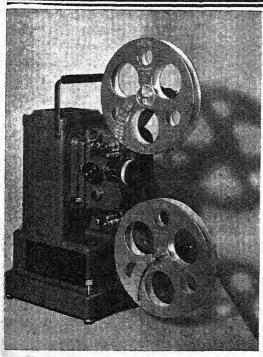
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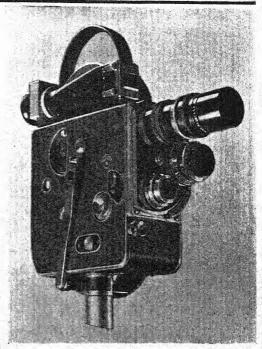
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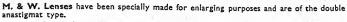
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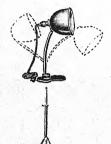


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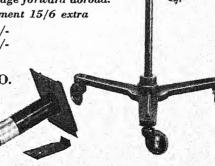
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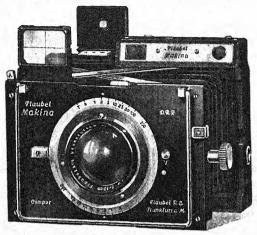
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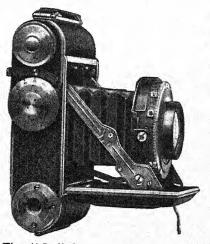
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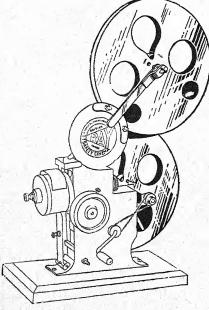
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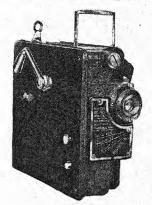
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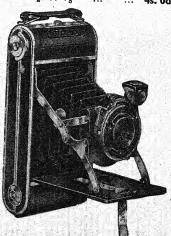
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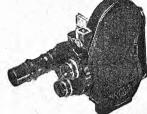
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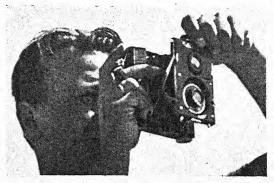
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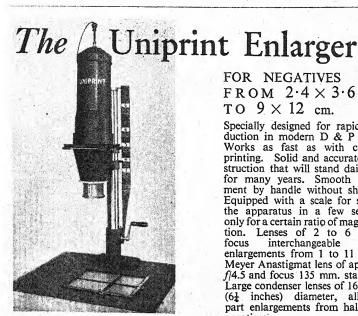
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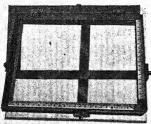
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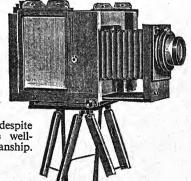
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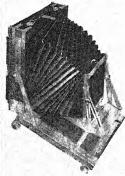
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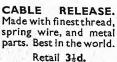
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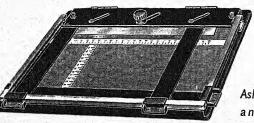


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Below is the list of contents:

ALFRED STIEGLITZ, PHOTOGRAPHER, by Nicholas Haz.
A TILTED PLATE METHOD OF TESTING PHOTOGRAPHIC LENSES,
by C. W. Kendall and E. B. Woodford.

THE MINIATURE CAMERA, by H. Crowell Pepper.
LANDSCAPE SUBJECTS, by H. W. Honess Lee.
PICTORIAL PHOTOGRAPHY WITH A MINIATURE CAMERA, by

L. M. A. Roy.

CLOUDS AND THEIR PHOTOGRAPHY, by Curt Foerster.

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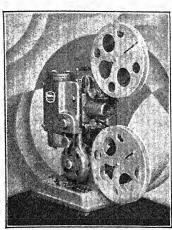
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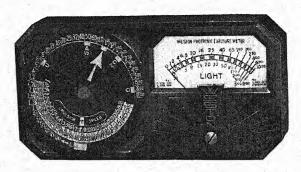
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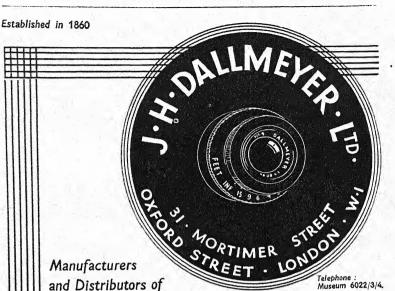
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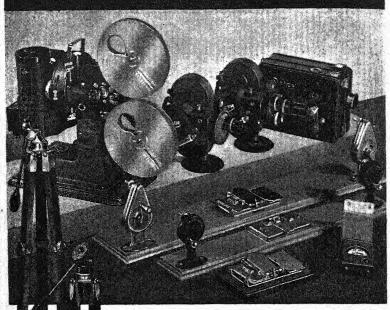
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American Hard Rubber Co. (Britain), Ltd., 101, Hatton Garden, London, E.C. 1. 'Phone, Holborn 6037. Tele-

grams—Eboniseth, Smith, London.
Arnott & Co. (Leeds), Ltd., Marshall's Mills, Holbeck, Leeds 11. 26303.

Artesque Agency, 30-31, Great Sutton Street, London, E.C. 1. 'Phone. Clerkenwell 6586.

Austin Edwards, Ltd., Coventry Road, Warwick. 'Phone, Warwick 108. Telegrams—Films, Warwick.

Automatic Coll Winder & Equipment

Automatic Con winder or Equipment Co., Ltd., 21, Douglas Street, London, S.W. 1. 'Phone, Victoria 3404. Telegrams—Autowina, Churton, London. Autotype Co., Ltd., 59, New Oxford Street, London, W.C. 1. 'Phone, Temple Bar 9331-2-3. Telegrams— Autotype, London; Autotype Works, Brownlow Road, West Ealing, W. 13. Phones, Ealing 2691-2-3. Telegrams-Autotype, West Ealing.

A.W.H. Sound Reproducing Co., Ltd.,

Camden Works, King's Road, London.

N.W. 1. 'Phone, Euston 2173.

Baird, Andrew H., 33-39, Lothian Street,
Edinburgh. 'Phone, Edinburgh 20916.

Telegrams—Radium, Edinburgh.

Baker, Charles, 244, High Holborn, London, W.C. 1. 'Phone, Holborn 1427. Telegrams—Optivorum, Holb., London.

Ballantine, Robert, 103¹, St. Vincent Street, Glasgow. 'Phone, Central 5619. Bamforth & Co., Ltd., Station Road, Holmfirth, Yorks. 'Phone 107. Tele-grams—Bamforth, Holmfirth. Barlow, J., & Co., 8-12, Lambeth Palace Road, London, S.E. 1. 'Phone, Waterloo 5312. Telegrams—Barlassoff,

Lamb, London.

Lamb, London.

Barratt's Photo Press, Ltd., 89, Fleet
Street, London, E.C. 4. 'Phone, Central
7734. Telegrams—Central 7735 London.

Barton, Harvey & Son, Ltd., St.

Michael's, Bristol. 'Phone 21723. Tele-

grams—Harvey Barton, Bristol. Bartons' (B'ham), Ltd., Roland Road, Handsworth, Birmingham. Northern 3391. Telegrams-Mountable, Birmingham. Also 14, Upper Thames Street, London, E.C. 4. 'Phone, Street, Lone Central 4191.

Bauchet, M., & Cie, 29, Red Lion Square, London, W.C.1. Phone, Chancery 8541. Telegrams—Zedabe-peay, Holb., London.

Bauer, Ltd., 137, Wardour Street, London, W. 1. 'Phone, Gerrard 1242. Telegrams—Cinesound, Rath, London.

Bausch and Lomb Optical Co., Ltd., 67, Hatton Garden, London, F.C. 1. 'Phone, Holborn 6604.

Bayer Products, Ltd., Africa House, Kingsway, London, W.C. 2. 'Phone, Holborn 8730.

Beard, R. R., Ltd., 10, Trafalgar Road. Old Kent Road, London, S.E. 15.

'Phone, Rodney 3136.

Bell & Howell Co., Ltd., 320, Regent
Street, London, W. 1. 'Phone, Langham
4376. Telegrams—Belanhowe, Wesdo, London.

Bennett & Jennison, Ltd., Ladysmith Road, Grimsby. 'Phone 2255. Tele-grams—Novelties, Grimsby. London showrooms, 67, Aldersgate Street, E.C.3.

Phone, National 9489.

Bentley Photo-mount Co., 32, Hatton Holborn 3975.

Beresford, F., 4, Albert Bridge Road,

Battersea, London, S.W. 11.

Beta, Ltd., Ashfield Road, Burnley,
Lancs. 'Phone, 2375. Telegrams—2375. Billcliff's Camera Works, Richmond

Street, Boundary Lane, Manchester, 15.
Bird, Graystone, 38, Milsom Street,
Bath. 'Phone 3319. Telegrams—Bird, Photographer, Bath.

Boots Pure Drug Co., Ltd. (Photographic Department), Stamford Street, London, S.E. I Phone, Waterloo 4911. Telegrams—Regesan, London.

Bowen's Camera Repair Service, Ltd., 114/115, Holborn, London,

Bowen's Camera
Ltd., 114/115, Holborn, London,
E.C. 1. 'Phone, Holborn 3126.

Bowler, Stanley W., 4, Majestic Mansions, 36a, Tottenham Court Road,
London, W. 1. 'Phone, Museum 6483.

Bowyer-Lowe, N. J., 3, Commerce Lane,
Yatchworth, Herts. 'Phone, Letchworth 688.

Road, London, N.W. 1. 'Phone, Museum 5127-8. Telegrams—Ozoniżed,

Norwest, London. British Camera Manufacturing Co., Ltd., 113, Queen's Road, Bayswater, London, W. 2. 'Phone, Bayswater 3636. British Cellophane Limited., 179, Tottenham Court Road, London, W. 1.

Phone, Museum 2162. Telegrams— Cellophane, Rath, London. British Commercial Gas Association, 28, Grosvenor Gardens, London, S.W. 1. 'Phone, Sloane 8226-7. Telegrams-

Gasupreme, Sowest, London. British Journal of Photography, 24, Wellington Street, Strand, London, W.C. 2. 'Phone, Temple Bar 5330.

Telegrams—Photometer, Rand, London. British Optical Lens Co., Victoria Works, Summer Lane, Birmingham.
Phone, Aston Cross 1156-1157-1158.
Telegrams—Galalith, Birmingham.

British Photographic Industries, Ltd., 88/89, High Holborn, London, W.C. 1. Phone, Holborn 6900. British Thomson-Houston Co., Ltd.,

Sound Reproducing Department, Rugby Phone, 286. Telegrams—Asteroidal, Rugby. Crown House, Aldwych, London, W.C. 2. 'Phone, Temple Bar 8040. Telegrams-Asteroidal, Estrand,

Brook, Parker & Co., Ltd., Ashfield, Horton Road, Bradford. 8237. Telegrams-Broparco, Bradford.

Bruce's, Ltd., 28a, Broadway, Ealing, London, W. 5. 'Phone, Ealing 1033. Burall Brothers, Wisbech, Cambs, 'Phone, Wisbech 113. Telegrams— 'Phone, Wisbech Burall, Wisbech.

Burr, Charles, 138, Wakefield Street,

East Ham, London, E. 6. Burroughs Wellcome & Co., Snow Hill Buildings, London, E.C. 1. 'Phone, Central 4000. Telegrams—Tabloid. Cent, London.

Busch (Emil), Optical Co., Ltd., 36-38, Dean Street, London, W. 1. 'Phone, Gerrard 7194-5. Telegrams-Buschop-

tik, Rath, London.

Buzzard, L., Ltd., Cotswold Road,
Bedminster, Bristol 3. 'Phone, Bristol 63118. Telegrams—Buzzard, Bristol.

Camera and Optical Exchange, 99, Waterloo Street, Glasgow, C. 2. Phone, Central 5447.

Camera Company, 320, Vauxhall Bridge Road, London, S.W. 1. 'Phone, Victoria 2977.

Cameras, Ltd., 185, Liverpool Road, Slough, Bucks. 'Phone, Slough 929.

Slough, Bucks. 'Phone, Slough 929. Telegrams—Cameras, Slough.

Camerascopes, Ltd., 30, Percy Street, London, W.1. 'Phone, Museum 8685.

Canadian Kodak Company, Limited, Toronto. Telegrams—Kodak, Toronto.

Cardine Accessories, Ltd., 18, Moorland Road, Bath. 'Phone, Bath 2955.

Telegrams—Cardine, Bath 2955.

Cassio Photographic Paper Co., Ltd., Cassio Bridge, Watford, Herts. 'Phone, Watford 3482. Telegrams—Cassio, Watford 3482. Watford.

Chance Brothers & Co., Ltd., Glass Works, Smethwick, near Birmingham. 'Phone, West Bromwich 1306. Telegrams—Chance, Smethwick. Scottish Works, Firhill, Glasgow. 'Phone, Mary-hill 98. Telegrams—Brogan, Glasgow. Chapman, J. T., Ltd., Albert Sq., Man-chester, 2. 'Phone, Blackfriars, 8478-9.

Telegrams-Camera, Manchester. Church Army Lantern and Cinematograph Dept., 14, Edgware Road, London, W. 2. 'Phone, Paddington 9212.
Telegrams—Landept, Padd. London.

Cinecraft Supplies, Ltd., Camera

Corner, Palmers Green, London, N.13.

'Phone, Palmers Green 0508.

Cinema Traders, Ltd., 26, Church
Street, Charing Cross Road, London,
W. 1. 'Phone, Gerrard 5287 and 5288.

Telegrams—Biocinema, Rath, London.

Ielegrams—Biocinema, Rath, London. Clnepro, Ltd., 1, New Burlington Street, London, W. 1. 'Phone, Regent 2085. Telegrams—Cinepro, Piccy, London. Clnex, Ltd., 70, High Holborn, London, W.C. 1. 'Phone, Holborn 4482.

W. 1. Phone, Hollotti 4402. City Sale and Exchange (1929), Ltd., 84, Aldersgate Street, London, E.C. 1. Phone, National 0591. Telegrams— Retoucher, Barb, London; 90 to 94, Fleet Street, London, E.C. 4. Phone, Cen. 9391. Telegrams—Films, Fleet,

London; 54, Lime Street, London, E.C. 3. 'Phone, Monument 0180. Tele-54, Lime Street, London, grams-Phototypic, Led, London; The Arcade, Broad Street, London, E.C. 2. 'Phone, Bishopsgate 6799; 59, Cheap-side, London, E.C. 2. 'Phone, City 1124.

Clay, S. & C., 105-107, Fowler Street, South Shields, Co. Durham. Colourgraphs, 47, Byron Road, North Wembley, Middlesex. Phone, Arnold

4447. Colour Photographs (British

Foreign), Ltd., Victoria Road, Willes-den, London, N.W. 10. 'Phone, Willesden, 7300.

Construments, Ltd., 18, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 7507.

Cook, W. T., Ltd., Acme Photo Works. Chaldon Road, Upper Caterham, Surrey. 'Phone, Caterham 167. Telegrams-Rotaries, Caterham, Surrey.

Coronet Carnera Co., 310, Summer Lane, Birmingham. 'Phone, Aston Cross 5804-5. Telegrams—Coronetcy, Birmingham.

Publishing Cotswold Co., Ltd., Wotton-under-Edge, Glos.

Criterion, Ltd., Criterion Works, Stechford, Warwickshire. 'Phone, Stechford 2007. Telegrams—Criterion, Stechford; 35, Essex Street, Strand, London, W.C.2.

35, ESEX Street, Strand, London, W.C.Z.
'Phone, Central 2536.

Croxley Manufacturing Co., Dominion
House, Bartholomew Close, London,
E.C. 1. 'Phone, National 6135.

Culkin, J., 113, North Street, Leeds 7.
'Phone, 27917. Telegrams—Cinelodex,
Leeds 7.

Leeds.

Dallmeyer, J. H., Ltd., 31, Mortimer Street, Oxford Street, London, W. 1. Phone, Museum 6022-3-4; Church End Works, Willesden, London, N.W. 10. 'Phone, Willesden 0176. Telegrams— Dallmeyer, London.

Detel Products, Ltd., Long Drive, Greenford, Middlesex. 'Phone, Perrivale 1337. Telegrams-Detel Phone London.

Dickinson, John & Co., Ltd., Apsley Mills, Hemel Hempstead, Herts. 'Phone, Boxmoor 124. Telegrams—Dickinson,

Apsley End.

Dixon, T. H., & Co., Ltd., Letchworth,
Herts. 'Phone, Letchworth 666.

Telegrams—Theko, Letchworth,

Dollond & Aitchison, Ltd., 192, Tottenham Court Road, London, W. 1.
'Phone, Museum 0852 (5 lines). Telegrams-Owl, London.

Doughtys, Ltd., 48, Savile Street, Hull.
'Phone, Central 31666. D. & P., Works,
141, Beverley Road, Hull. 'Phone, Central 7618.

Dowty, E. F., Ltd., Walker Street, Blackpool, Lancs. 'Phone, Blackpool 2167. Cross Street, Windermere. 'Phone, Windermere 431, also Clarendon Road, Morecambe. 'Phone, 398. Dowty, Ltd., Castle Hill, Douglas, I.O.M. 'Phone, Douglas 199.

D.P. Films, Ltd., 40-42, Osnaburgh Street, London, N.W. 1. 'Phone, Museum 1171.

Drem Products, Ltd., 37, Bedford

Street, Strand, London, W.C. 2. 'Phone, Temple Bar 8858-9. Telegrams-Dremcorp, Lesquare, London. Edgington, John & Co., Ltd., Sardinia

House, Sardinia Street, Kingsway, London, W.C. 2. 'Phone, Holborn London, W.C. 2. Phone, Holborn 0734. Telegrams—Abri, Holb. London. Electric Production Co., 90, George

Street, Baker Street, London, W. 1.

Phone, Welbeck 7652.

Elliott & Sons, Ltd., Barnet, Herts.

'Phone, Barnet 0011. Telegrams—
Elliott, Barnet.

Empire Background Co., "Chez Nous," Chapel Road, Hesketh Bank, Near Preston, Lancs.

Ensign, Ltd., Ensign House 88/89, High Holborn, London, W.C. 1. 'Phone, Holborn 6900. Telegrams—Bromide, 'Phone, London. Works: Walthamstow, E. 17. Branches: Glasgow, Swansea, Birmingham, Canterbury, Cardiff, Belfast, and at Bombay and Calcutta.

Ensign Snapshot Service, Victoria Road, Walthamstow, London, E. 17. 'Phone, Larkswood 2233 (2 lines). Telegrams-Ensiprin, Phone, London.

Epstein, J., & Co., Ltd., Mivart Street, Easton, Bristol 5. 'Phone, 57047. Telegrams-Mouldings, Bristol.

E.S.S. Colour Filter Co., 22, Bloomsbury Street, London, W.C. I. 'Phone. Museum 2161.

Fairbrother, E. J., 7, Museum Street, London, W.C. 1. 'Phone, Temple Bar

Fallowfield, Jonathan, Ltd., 61-62, Newman Street, Oxford Street, London, W. 1. Phone, Museum 8318. Telegrams—Fallowfield, Rath, London. Farrow, E. H., 84, Hazelville Road, Hornsey Rise, London, N. 19.

Fasa (England), Ltd., Fasa Works, Sandridge Street, St. Albans, Herts. Filmyu, Ltd., 22, Litchfield Gardens, Willesden Green, London, N.W. 10.

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Road, Manchester 13. 'Phone, Ardwick 3533. Telegrams—Slides, Manchester. Fleming, R. A., & Co., Ltd., 32, Lord Street, Liverpool 2. 'Phone, Bank 819.

Fordham & Co., Ltd., Victoria Works, Victoria Road, Walthamstow, London, E. 17. 'Phone, Walthamstow 0244.

Telegrams—Permanent, Phone, London. Fotet Camera Co., 18, Cross Street, Hatton Garden, London, E.C. 1. Phone, Holborn 2510.

Fourdrinier, Hunt & Co., Ltd., 8, Chingford Mount Road, London, E. 4. 'Phone, Silverthorn 2241.

Fox Photos, 6, Tudor Street, London, E.C. 4. 'Phone, Central 7831-5. Tele-

grams—Foxfotopic, Fleet, London.
Fox, R., Ltd., 14/24, Britannia Street,
King's Cross, London, W.C. 1. 'Phone, Terminus 6381.

Fry, E. B., Ltd., Malden Factory, Malden Crescent, Kentish Town,

London, N.W. 1. 'Phone, Gulliver 2274. Telegrams—Frylant, Norwest, London, Fry, S. H., 5, Highbury Grove, London, N. 5. 'Phone, Canonbury 2400. Tele-grams—Fry, Can 2400.

Gandolfi, Louis & Sons, 2, Borland Road, Stuart Road, Peckham Rye, London, S.E. 15. 'Phone, New Cross 1640.

& Jones, Ltd., Polebrook Carner House, Golden Square, London, W. 1.

riouse, Goiten Square, London, W. I.

'Phone, Gerrard 2300. Telegrams—
Gerrard 2300, London.

Garratt & Atkinson, Warwick Works,
Ealing, London, W. 5. 'Phone, Ealing
1871. Telegrams—Atkingarr, Phone, London.

Gasparcolor, Ltd., 3, St. James's Square, London, S.W. 1. 'Phone, Whitehall 8701-2. Telegrams—Gasparcol, Piccy,

London.

G. B. Equipments Limited, 142-150, Wardour Street, London, W. 1. 'Phone, Gerrard 9292. Telegrams—GeBescope, Rath, London.

Rath, London.

Gear, John H., 8, Nottingham Terrace,
Marylebone Road, London, N.W. 1.

'Phone, Welbeck 2204.

General Electric Co., Ltd., Magnet
House, Kingsway, London, W.C. 2.

'Phone, Temple Bar 8000. Telegrams

Electricity Western London.

—Electricity, Westcent, London.

Gevaert, Ltd., 115, Walmer Road,
North Kensington, London, W. 10.

'Phone, Park 4333 (2 lines). Telegrams

—Artoves, Nottarch, London.

Gibbons, A. O., Ltd., 16, Carlisle Street,
Dean Street, London, W. 1. 'Phone, Gerrard 2128.

Gibson, C. M., 7, Kirby Street, Hatton Garden, London, E.C. 1. 'Phone, Holborn 0800.

Gilby & Herrmann, Ltd., 7-8, Plumtree Court, Farringdon Street, London, E.C. 4. 'Phone, Central 1201-2. Telegrams—Glinkby, Phone, London. Glanvill, H. G., 256, Balsall Heath Road, Birmingham. Telegrams—

South, 1893.

Oughtibridge, Glazine Pad Co.. Yorkshire. Gorse, Edwin, 86, Accrington Road,

Blackburn, Lancs. 'Phone 6918. Telegrams—Gorse 6918, Blackburn Graber, Ellis, 16, Newton Road, Tun-

Wells. Telegrams-Graber. Tunbridge Wells.

Grant, Thos. K., Ltd., Polebrook House, Golden Square, London, W. 1. 'Phone, Gerrard 2300. Telegrams—Gerrard. Telegrams-Gerrard,

Gerrard 2300. Telegrams—Gerrard, 2300, London.
Graphic Films, Thames House, Millbank, London, S.W. 1. 'Phone, Victoria 9696.
Greeff, R. W., & Co., Ltd., Thames House, Great Queen Street, London, E.C. 4. 'Phone, Central 6550. Telegrams—Greeff, Cannon, London, Green, A. W., 70, High Holborn, London, W.C. 1. 'Phone, Chancery 7004.
Telegrams—Green, Chancery 7004.
Greenwood, Henry & Co., Ltd., 24, Wellington Street, Strand, London, London,

Wellington Street, Strand, London, W.C. 2, 'Phone, Temple Bar 5330 Telegrams-Photometer, Rand, London. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C. 2. 'Phone, Temple Bar 2621. Telegrams—Gramme, Westcent, London.

Griffiths Bros., & Co., London, Ltd., Macks Road, Bermondsey, London, S.E. 16. 'Phone, Bermondsey 1151. Telegrams—Aquol, Phone, London.

Griffiths, R., 26-31, Eyre Street Hill, 'Phone, Holborn, London, E.C. 1. Clerkenwell 5867. Telegrams-Eyragrif, Holb, London.

Guiterman, S., & Co., Ltd., 35 and 36, Aldermanbury, London, E.C.2. 'Phone, Metropolitan 8074, Telegrams-Guiterman. Phone. London.

Gulliman, Granville & Co., Ltd., 29, Warwick Place, Learnington Spa. 'Phone, 847. Telegrams—Granville, Leamington. 13, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 5688.

Halden, J., & Co., Ltd., 8, Albert Square, Manchester. 'Phone, Heaton Square, Manchester. 'I Moor 2241 and 2242. Telegrams-Halden, Manchester.

Hall, B. J., & Co., Ltd., Stourton House, Dacre Street, London, S.W. 1. 'Phone, Whitehall 5302-6. Telegrams—

Inspect, Sowest, London.
Halliday, C. H., & Co., Ltd., Holbeck
New Mills, Holbeck Lane, Leeds. 'Phone, Leeds 22251. Halmac, Leeds. Telegrams-

Hamel, E., & Co., Premier Studios, Palmerston Street, Woodborough Road, Nottingham, 'Phone, 41547 (2 lines). Telegrams—Hamel, Nottingham.

Harbutt's Plasticine, Ltd., Bathampton, Bath. 'Phone, 8209. Telegrams—Plasticine, Bath. London Office and Showroom, 56, Ludgate Hill, E.C. 4. 'Phone, City 7362.

Hardtmuth, L. & C. (Gt. Britain), Ltd., Koh-i-noor Factory, Stafford Road, Croydon. Phone, Croydon 5185.

Harper Automatic Machine Manufacturing Co., Ltd., Automatic Works, Stafford Road, Croydon. 'Phone, Croydon 5571. Harrap, John & Son, 3, Holborn

Buildings, Holborn Bars, London, E.C. 1. 'Phone, Holborn 2020. Telegrams—Harsonart, Smith, London. Harringtons, Ltd., 386, George Street, Sydney, N.S.W.; also Katoomba,

Newcastle, Melbourne, Brisbane, Adelaide and Perth, Australia. Cables—Harrington, Sydney.

Haseler, Charles & Son, Ltd., 390-395, New John Street West, Birmingham, 19. 'Phone, Telegrams—Aston Cross 0631, Birmingham.

Hathernware, Ltd., Loughborough, Leicestershire. 'Phone, Hathern 61.

Telegrams—Bricks, Loughborough.

Heaton, Ltd., Wallace, 119, New Bond
Street, London, W. 1. 'Phone, Mayfair Street, London, W. 1. Prone, Maytair 0924-5-6; also 47, Berkeley Street, W. 1. 'Phone, Grosvenor 2691, and 43 High Street, Kensington. Telegrams—Zodellaria, Wesdo, London. Works and Studios, 28-30, Avery Row, London, W. 1. 'Phone, Maytair 4484. Heatrae, Ltd., Heatrae Works, Norwich. Phone, Norwich 3491. Telegrams-

Phone, Norwich.
Heatrae, Norwich.
Hewittic Electric Company, Ltd.,
Thanes Surrey. Phone, Walton-on-Thames, Surrey. Walton-on-Thames, 762, 763. Walton-on-Thames, 762, 763. Telegrams-Hewittic, Walton-on-Thames.

Higgins, C. M., & Co., Ltd., 16-20, Farringdon Avenue, London, E.C. 4. 'Phone, Central 3763. Plicated, Fleet, London. Telegrams-

Hilger, Adam, Ltd., 98, King's Road, Caniden Road, London, N.W. I. Phone, Gulliver 5426. Telegrams— Sphericity, Phone, London.

Hirst, Brooke & Hirst, Ltd., Sheepscar Works, Leeds, 7. 'Phone, 31155.

Works, Leeds, Friedrich, Orion, Telegrams—Hirst, Leeds, Hiscock, H., 67, Moorgate, London, E.C. 2. Phone, Metropolitan 0717. Hockett, S. W., Photographic Works, Potters Road, New Barnet, Herts.

'Phone, Barnet 0158.

Holmes Brothers (London), Ltd., Holbro Works, Billet Road, Waltham-stow, London, E. 17. 'Phone, Larks-wood 1086 (3 lines). Telegrams— Dogfish, Phone, London.

Home Cine-Cameras, Ltd., 18, Gray's Inn Road, London, W.C. 1. 'Phone,

Holborn 7507.

Hood & Co., Ltd., Sanbride Works, and 97, Albert Road, Middlesbrough. Phone, 2518. Telegrams-Sanbride. Middlesbrough.

Hora, Tudor T., 9, Geraldine Road, Wandsworth, London, S.W. 18.

Horne's Camera Mart, 58, Old Broad Street, E.C. 2. 'Phone, London Wall 3001; and 32, Gracechurch Street, London, E.C. 3. 'Phone, Mansion House 6880.

Houghton, C., 28, Russell Street, Heaton Park, Manchester.

Houghton - Butcher Manufacturing Co., Ltd., Fulbourne Road, Walthamstow, London, E. 17. 'Phone, Larkswood Telegrams-Rhamnus, 1081. Phone, London.

Howell, Charles, Owl Works, Bonny Street, Blackpool.

Howerth, H. E., Ltd., 43, Victoria Street, Fleetwood, Lancs. 'Phone, Fleetwood 557. Telegrams—Howorth 557 Fleetwood.

Hughes, W. C., & Co., 132, Englefield Road, Essex Road, London, N. 1. 'Phone, Clissold 1122.

Hunter, R. F., Ltd., Celfix House, 51, Gray's Inn Road, London, W.C. 1. 'Phone, Holborn 7311-2. Telegrams— Buxhunter, Holb., London.

Hunter-Penrose, Ltd., 109, Farringdon Road, London, E C. 1. 'Phone, Clerken-well 6626. Telegrams—Huntomatic, Smith, London. 69, Charlotte Street, Birmingham. 'Phone, Central 7427. Afa and 47, Market Street, Manchester, City 2169; 349, Cathedral Street, Glasgow. Phone, Bell 1405.

Histra Enterprises, 159, Wardour St., London, W. 1. 'Phone, Gerrard 6889.

Hford Limited, Hford, London. 'Phone, liford 3000 (20 lines). Telegrams— Plates, Phone, Ilford. Works, Ilford and Brentwood, Essex, Park Royal, Willesden Junction, N.W. 10, Watford, Herts; Mobberley, Cheshire. Ilford Galleries and London Depot, 101, High Holborn, W.C. 1. 'Phone, Chancery 8532; Cine Sales Dept., National House, 60-66, Wardour Street, W. 1. 'Phone Gerrard 2763. Telegrams-Seloservs, Certain 2700. Tergiants—Sciosrava, London; Radiographic Dept., Tavistock House North, Tavistock Square, W.C. 1. 'Phone, Euston 2251; 3, Cadogan Street, Glasgow, C. 2. 'Phone, Central 7511; 16, Park Place, Leeds. 'Phone, Leeds 25320; 22, Lloyd Street, Albert Square, Manchester, 'Phone, Blackfriars 8512; 18, Oxford Street, Newcastle-upon-Tyne. 'Phone, New-castle 25877; 22, Upper Ormond Quay, Dublin. 'Phone 21883.

Imperial Chemical Industries, Ltd., Millbank, London, S.W. 1. 'Phone, Vic. 4444. Telegrams—Impkemix, Telex.

London,

Imperial Dry Plate Co., Ltd., Ilford, London. 'Phone, Ilford 3000 (20 lines). Telegrams-Impeople, London.

Infallible Exposure Meter Co., Wrex-ham. 'Phone, Coedpoeth 26. Telegrams-Infallible Exposure, Coedpoeth. Ipa Photographics, 8, 10 & 12, Lambeth

Palace Road, London, S.E. I. 'Phone, Waterloo 5312-3. Telegrams - Barlassoff, Lamb, London.

Janovitch, M., & Co., 19, Broad Street, Golden Square, London, W. I. 'Phone, Gerrard 2202. Telegrams—Uniplates, Piccy, London.

Jeffery & Boarder, 55 and 56, Mattock Lane, West Ealing, London, W. 13.

'Phone, Ealing 0875.

Jepson, Warren & Co., Regent Works, off Hyde Park Road, Leeds. 'Phone, 26294. Telegrams—Jepson, Regent Works, Leeds.

Johnson & Sons, Manufacturing Chemists, Ltd., Hendon, London, N.W. 4. 'Phone, Hendon 8051 (4 lines). Telegrams—Caustic, London. Man-chester Office, 12, Queen Street, Deansgate. 'Phone, Blackfrairs 0115. Telegrams—Caustic, Manchester.

Johnson & Sons, Smelting Works, Ltd., Creek Works, Brimsdown, Middle-sex. 'Phone, Enfield 1677 (3 lines). Telegrams-Cauterism, Enfield.

Johnson, Matthey & Co., Limited, 73/83, Hatton Garden, London, E.C. 1. Phone, Holborn 6989. Telegrams-Matthey, Smith, London.

Johnson, Wm., & Sons (London), Limited, 289/299, Borough High Street, London, S.E. 1. 'Phone, Hop 1485.

Jones, Samuel & Co., Ltd., Bridewell Place, London, E.C. 4. 'Phone, Central 6500. Telegrams—Noncurling, Lud, London.

Kalton, G., 61, Farringdon Road, London, E.C. 1. 'Phone, Holborn 2763. Telegrams—Holborn 2763.

Kamy, Ltd., 22, Bunhill Row, London, E.C. 1. 'Phone, National 1508.

Kandem Electrical, Ltd., 711, Fulham Road, London, S.W. 6. 'Phone, Fulham 2387-8. Telegrams-Kortmath, Walgreen, London.

Kaufmann, Simon, Tottenham Mews, Tottenham Street, London, 'Phone, Museum 4674.

Kay Photo Machines, Ltd., 22, Bunbill Row, London, E.C. 1. 'Phone, National

Keen, Allan P., & Co., Ltd., 19, Cannon Hill Road, Coventry.

Kentmere, Ltd., Staveley, Westmorland. 'Phone, Staveley 65. Telegrams Kentmeres, Staveley, Westmorland. Telegrams-

Kershaw, A., & Son, 200, Harehills Lane, Leeds. 'Phone, Chapeltown 41081-2. Telegrams-Science, Leeds.

Kingsway Electrical Services, 54, Bloomsbury Street, London, W.C. 1. 'Phone, Museum 3566.

Klix, Ltd., 131, Regent Street, London, W. 1. 'Phone, Regent 1000. Cables— Klix, London.

Klix, London.

Kodak, Limited, Kingsway, London,
W.C. 2. 'Phone, Holborn 7841. Telegrams—Kodak, London. Works,
Wealdstone, Middlesex. 'Phone, Harrow 0080. Telegrams—Kodak, Wealdstone; 70, Lord Street, Liverpool.
'Phone, Bank 3563/4. Telegrams—
Kodak, Liverpool; 46, Buchanan
Street, Glasgow. 'Phone, Bell 1060. Telegrams—Kodak, Glasgow; 110, Grainger Street, Newcastle-on-Tyne. Central 21663. Telegrams—Kodak, Newcastle-on-Tyne; 45, Corporation Street, Birmingham. 'Phone Central Street, Birmingham. 'Phone Central 7966. Telegrams—Kodak, Birmingham; 89, Grafton Street, Dublin. 'Phone, Rathmines 91798-9. Telegrams— Kodak, Dublin.

Kodak, Limited, Kodak House, Hornby Road, Bombay. Telegrams—Kodak Bombay. Branches: Calcutta, Madras and Lahore.

Kodak, Limited, 130, Robinson Road, Singapore. Telegrams-Kodak, Singapore.

· Kodak, dak, Limited, No. Batavia Centrum, D.E.1. Noordwyk

(Australasia) Proprietary, Ltd., Melbourne. Telegrams-Kodak, Melbourne, Sydney, Adelaide, Brisbane, Perth, Toowoomba, Townsville and Rockhampton, Australia; Hobart, Tasmania.

Kodak, New Zealand, Ltd., 16-18, Victoria Street, Wellington, N.Z. Telegrams—Kodak, Wellington, N.Z. Branches: -Auckland, Dunedin and Christchurch.

Kodak (East Africa), Ltd., Zebra House, P.O. Box 28, Nairobi. Branches:

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Nakuru and Mombasa; Uganda: Nakuru and Mombasa; Uganda: Kampala and Jinja; Tanganyika: Dar-es-Salaam, Arusha, Tanga and Moshi.

Kodak (South Africa), Ltd., Kodak House, Corner of Shortmarket and Loop Street, Cape Town. Telegrams-Kodak Cape Town. Branches :- Durban and Johannesburg.

Kodak (Egypt) S.A., Cairo. Branches: Alexandria (Egypt), Haifa (Palestine), Beirut (Syria), Instanbul (Turkey), Beirut (Syria), Athens (Greece).

Kosmos Photographics, Ltd., Letchworth, Herts. 'Phone, 128. Telegrams—Kosmos, Letchworth; also 155, Victoria Street, London, S.W. 1. 'Phone, Victoria 2685.

Lancashire Ferrotype Co., Masonic Hall Buildings, Adelaide Street, Blackpool, Lancs.

Lancaster, J., & Son, Ltd., 54, Irving Street, Birmingham 15. 'Phone, Midland 0372.

Lechertier, Barbe, Ltd., 95, Jermyn Street, London, W. 1. 'Phone, White-hall, 2938. Telegrams—Lechertier,

Piccy, London.

Leeda Photographic Co., Ltd., Weybridge Road, Weybridge. 'Phone, Weybridge 1497.

Leigh, L. A., & Co., 179, West End Lane, London, N.W. 6. 'Phone. Maida Vale 7902.

Leitz, E. (London), 20, Mortimer Street, London, W. 1. 'Phone, Museum London, W. 1. 'Phone, Museum 3776-7. Telegrams—Microtome, Phone,

London.
Lethaby, W., & Co., Leda House, 124-132, Clerkenwell Road, London, E.C. 1. 'Phone, Clerkenwell 5004.

Lizars, J., 101-107, Buchanan Street, Glasgow. 'Phone, Central 8062. 381, Sauchiehall Street, Glasgow. 'Phone, Douglas 1669. Telegrams—Lizars, Glasgow; Factory, Glasgow; 6, Shandwick Place, Edinburgh. 'Phone 22272. wick Place, Edinburgh. 'Phone 2' Telegrams—Optical, Edinburgh; 118, Union Street, Aberdeen. Phone, 2324. Union Street, Aberdean: Talon, Joseph Telegrams—Lizars, Optician, Aberdeen: 71, Bold Street, Liverpool. 'Phone, Royal 1882. Telegrams—Lizars, ROyal 1852. 1etegratus—Lizars, Optician, Liverpool; 27, High Street, Paisley. 'Phone, 2238. Telegrams—Lizars, Optician, Paisley; 14, West Blackhall Street, Greenock. 'Phone, 877. Telegrams—Lizars, Optician, Greenock; 12, Muir Street, Motherwell.
'Phone, 68. Telegrams—Lizars, Optician
Motherwell; 8, Wellington Place,
Belfast. 'Phone, 1028. Telegrams— Lizars, Belfast.

Lockyer, J. E., Ltd., 244, Evelyn Street, Deptford, London, S.E. 8. 'Phone, New Cross 0596.

London Camera Exchange Co., Ltd. (The), 20, Bucklersbury, Queen Victoria Street, London, E.C. 4. 'Phone, City 4591. Telegrams-Loncamerex, Cannon, London.

L.C.C. School of Photo-Engraving and Lithography, Bolt Court, Fleet Street, London, E.C. 4. 'Phone, Central 4153. L.C.C. Trade School (Photographic

Department for Women and Girls), Queen Square, Bloomsbury, London, W.C. 1. 'Phone, Holborn 4627. London Instrument Co., Ltd., 51a,

Bridge Street, Cambridge 'Phone,

Cambridge 4443. Telegrams-Cambridge 4443.

London Pharmacists' D. & P. Service, Ltd., Nightingale Grove, Hither Green, London, S.E. 13. 'Phone, Lee Green 5023.

Lord's Carnera Works, Wardleworth, Rochdale. Telegrams—Camera Works. Rochdale.

Lumex, Ltd., Dame Lane, Dublin.
Phone, Dublin 22736. Telegrams—
Lumex, 22736 Dublin.

Luminos Limited, 22, Bartlett's Buildings, Holborn Circus, London, E.C. 4. Phone, Central 1821. Central 1821, London. Telegrams-

McKaig, W. H., Meter Works, Friar Street, Hereford. Telegrams—McKaig, Meters, Hereford.

Mackenzie & Co., 212, Old Dumbarton Road, Glasgow. 'Phone, Western 613. Telegrams—Daylight, Glasgow.
MacLeod, Angus M., 43, Rathgar

Ealing, Avenue, Ealing, 'Phone, Ealing 1387. London, W. 13.

Mallinson, Rufus H., 7, Rose Crescent. Cambridge.

Manchester College of Technology (Department of Printing and Photographic Technology), Sackville Street, Manchester. 'Phone, Central 3624. Telegrams-Printing, Technology, Manchester.

Manistre, H. E., 113, Queen's Road, London, W. 2. 'Phone, Bayswater 3636, Marion & Foulger (1933), Ltd., Manna Works, Bedford. 'Phone,

Bedford 3261. Marshall & Co. (Nottingham), Ltd., Ford Street, Nottingham Road, Notting-'Phone, 75386. Telegrams-

Marshall, Photo, Nottingham.

Marshall, N., Moorgate Street, Radford,
Nottingham. 'Phone, 7077.

Marshall Sound System, Ltd., Gamble Street, Nottingham.

Maskens, A., & Sons, 2, Halton Road, Cross Street, Islington, London, N. 1.

'Phone, Canonbury, 3130.

Mason, Thos. H., 5-6, Dame Street,
Dublin, C. 1. 'Phone, 52191-2 (two lines). Telegrams-Mason, Dublin 52191. Master Photo Finishers, Ltd., 33,

John's Mews, Bloomsbury, London, W.C. I. 'Phone, Hol. 1147. Mather, E., & Co., Ltd., 7, Victoria Bridge, Manchester. 'Phone, Black-

Bridge, Manchester. friars 6133. Telegrams-Sensitised, Manchester. Matthews, B., 134-140, Idle Phone, Idle Road,

Bradford, Yorks. 'Phone, Telegrams—Postcards, Bradford.

Mawson & Swan, Ltd., Teams Works, Gateshead, Co. Durham, and 13, Mosley Street. Newcastle-on-Tyne. Telegrams-Mands, Dunston 144.

Lunston 144. 1eiegrams—Mands, Newcastle-on-Tyne.
May & Baker, Ltd., Dagenham.
Phone, Ilford 3060 (10 lines). Telegrams—Bismuth, Phone, London.
May, Roberts & Co., Ltd., 7-13, Clerkenwell Road, London, E.C. 1.
Phone, Clerkenwell 8260. Telegrams—Taothburgh Smith London. Toothbrush, Smith, London.

Merrett & Co., Trowbridge, Telegrams-Merrett, Trowbridge,

Middlemass & Co., Ltd., Islington Wharf, Penryn, Cornwall. 'Phone, Penryn, 137. Telegrams, Middlemass, Penryn.

Middlesex Colouring Co., West Drayton, Middlesex.

Miller Bros., Hall & Co., Ltd., Back Hilton Road, Aberdeen. 'Phone 1487. Miller Cine Co., Ltd., Elmbridge Road,

Gloucester. 'Phone 2893.

Miller, F. W., & Co., Ltd., 68, Nansen Road, Sparkhill, Birr ingham. 'Phone, Springfield 1410. l'elegrams-Miller, Springfield 1410, Birmingham.

Miscellaneous Trading Co., Ltd. (The), 13, New Oxford Street, London, W.C. 1. 'Phone, Holborn 4894.

Modern Traders, Ltd., 8-10, Oxford Circus Avenue, 231, Oxford Street, London, W. 1. 'Phone, Gerrard 2373-4. Telegrams-Modtradlim Wesdo London.

Moore & Co., 101 and 103, Dale Street, Liverpool. 'Phone, Central 5284. Telegrams—Solutions, Liverpool.

Morat, F., & Co., Ltd., 68, Basinghall Street, London, E.C. 2. 'Phone, Metropolitan 3131.

Mottrix, Limited, 32, Duppas Hill Lane, Crovdon. Surrey. 'Phone, Croydon

Munro, R. W., Ltd., 103-149, Cornwall Road, South Tottenham, London, N.15. 'Phone, Stamford Hill 1134. Telegrams-Munrengic, Phone, London.

Musikon, Ltd., 19, Lisle Street, London, W.C. 2. 'Phone, Gerrard 7105. Telegrams—Titles, Lesquare, London.

National Optical Company, Ltd., Stoughton Street 'Phone, 20134. Telegrams—Lenses, Leicester. Newman & Guardia, Ltd., 63, Newman

Street, Oxford Street, London, W.1. 'Phone, Museum 1081. Telegrams-Goniometer, Rath, London. Newman & Sinclair, Ltd., 2, Salisbury

Road, Highgate, London, N. 19. Phone, Archway 1013. Telegrams—

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Newton & Co., 72, Wigmore Street,
London, W. 1. 'Phone, Welbeck 4131 London, W. 1. (2 lines). Wesdo, London. Telegrams-Newtobar,

Newton & Co., Ltd., 43, Museum Street, London, W.C. 1. Phone, Holborn 7749.
Telegrams—Transopti, Phone, London,
Norse Trading Co. (London), Ltd.,
47, Berners Street, London, W. 1.

'Phone, Museum 4142. Novobax, Ltd., Rickmansworth Road, Watford, Herts. Telegrams—Novobax,

Watford. Oldfield, J., & R., Ltd., Refulgent Works, Warwick Street, Birmingham. 'Phone, Victoria 3019. Telegrams—

Dependence, Birmingham.
Oram and Robinson, 2, Academy
Buildings, Fanshaw Street, Hoxton,
London, N. 1. 'Phone, Clerkenwell 8927.

Ormskirk Photo Services, Park Road,

Ormskirk. 'Phones, Ormskirk 380-381. Telegrams-Photo-Services, Ormskirk.

Ozalid Co., Ltd., 1, Central Buildings, London, S.W.1. 'Phone, Whitehall 4872 (2 lines). Telegrams—Ozalidcom, Parl, London.

Page Electrical Equipments, King Alfred's Place, Broad Street, Birmingham. 'Phone, Midland 4377.

Palmer, W. E., & Sons, 32, Leicester Road, New Barnet. 'Phone, Barnet 0257.

Panora, Ltd., 56-58, Eagle Street, London, W.C. 1. 'Phone, Chancery 7779. Pathescope, Ltd., North Circular Road, Cricklewood, L. adon, N.W. 2. 'Phone, Gladstone 6544. Telegrams, Pathescope, Gold, London. London Showroom: 10, Great Marlborough Street, W 1. 'Phone, Gerrard 5736. London.

Pearce, Walter & Co., St. George's Press, Brentford, Middlesex. 'Phone, Ealing 4703. Telegrams—St. George's

Press, Brentford.

Pearson, E. T., & Co., Ltd., Photographic Department, London Road, graphic Department, London Road, Mitcham, Surrey. 'Phone, Mitcham 0882. Telegrams—Pearsonet, Mitcham.

Peat Products (Sphagnol), Ltd., 21, Bush Lane, Upper Thames Street, London, E.C. 4. 'Phone, Mansion House 8494. Telegrams—Bluejacket,

Cannon, London.
Peeling & Van Neck, Ltd., 4-6,
Holborn Circus, London, E.C. 1. 'Phone,
Central 9196. Telegrams—Photopsia, Phone, London.

Pemberton Bros., 60, Hornby Road, Blackpool, Lancs. 'Phone 1506.

Perfex Photo Service, Melksham, Wilts. Phone, Melksham 19. Telegrams-

'Phone, Nichadam', Phone, 19, Melksham.

Perken, Son & Co., Ltd., 94, Hatton, 'Phone, Garden, London, E.C. 1. 'Phone, Holborn 0724. Telegrams—Optimus, Smith, London,

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C. 2. 'Phone, Gerrard 7777. Telegrams—Phillamps, Westcent, London.

Phillips, F. G., Ltd., 44, Farringdon Street, London, E.C. 4. 'Phone, Holborn 6403-6404. Telegrams— Binocle, Cent, London.

Photo Finishers (Sheffield), Ltd., Union Road, Sheffield, 1. 'Phone, 50791.

Photographia (Golders Green), Ltd., 873, Finchley Road, London, N.W. 11. 'Phone, Speedwell 2200. Telegrams— Photographia, Golders Green.

Photographic Film Manufacturers, Ltd., Scots Bridge, Rickmansworth, Herts, 'Phone, Rickmansworth 920.

Photographic Sales, Ltd., 269, Kingston Road, Merton, London, S.W. 19. 'Phone, Liberty 3311.

Photographic Service & Supply Co., Ltd., Thames House, Millbank, London, S.W. 1. Phone, Victoria 9696.

Photopress, Ltd., 10, Johnson's Court, Fleet Street, London, E.C. 4. 'Phone, Central 5335-6. Telegrams—Photopress, Fleet, London.

Photostat, Ltd., Bush House, Aldwych, London, W.C. 2. Phone, Temple Bar 7376; and 14/20, St. Mary Axe, E.C. 3. 'Phone, Avenue 7715. Telegrams— Photostat, Bush, London.

Photo Trading Co., Ltd., Change Alley, Sheffield. 'Phone, 26255. Telegrams—

Films, Sheffield.

Pickard, Chas. R. H., & Son, 9A, Kirkgate, Leeds I. 'Phone, 24803. Telegrams-Pickard, Photographer, Leeds.

Pictorial Machinery, Ltd., 47, Hatton Garden, London, E.C. 1. 'Phone, Holborn 1848 and 1849. Telegrams— Pictograph, London.

Pilkington Bros., Ltd., Glass-works, St. Helens. Lancs. 'Phone, 4001. Tele-St. Helens, Lancongrams—Pilkington, Phone, St. Helens, 164, Shepherdess Walk, Hoxton, N. I. grams-Pilkington, Phone, London.

Pirim, 40, Pall Mall, London, S.W. 1. 'Phone, Whitehall 0094.

Plantinotype Company, 66, High Street, Penge, London, S.E. 20. 'Phone, Sydenham 7562. Telegrams—Platinotype, Westnor, London.

polyfoto Limited, 141, New Bond Street, London, W. 1. 'Phone, Mayfair 0334. Telegrams—polyfoto, Wesdo, London.

Polytechnic School of Photography and Kinematography, 309, Regent Street, London, W. 1 'Phone, Langham 2020. Telegrams—Polytechnic, Wesdo, London.

Potts, George H., Ltd., 7-9, Baker Street, London, W. 1. 'Phone, Welbeck 8484.

Presenta, Ltd., 74, Chiswell Street, London, E.C. 1. 'Phone, National 5087. Oix Publicity, Garside's Buildines, Park Road, Ormskirk 'Phone, Ormskirk 380.

Raines & Co. (Ealing), Ltd., The Studios, Ealing, London, W. 5. 'Phone, Ealing 3177 (3 lines). Telegrams-Raines, Ealing.

RCA Photophone, Ltd., Electra House, Victoria Embankment, London, W.C. 2. Phone, Temple Bar 2971. Telegrams -Ircapp, Estrand, London.

Riley, John, & Sons, Ltd., Chemical Works, Hapton, near Burnley, Lancs. 'Phone 290, Padiham. Telegrams— Riley's, Hapton.

Robinson & Sons, Ltd., Wheat Bridge Mills, Chesterfield. 'Phone, 2105. Telegrams—Boxes, Chesterfield. 168, Old Street, London, E.C. I. 'Phone, Clerken-well 8461. Telegrams—Staglint, London.

Roll Film Co., Ltd., Photo Works, Nursery Road, Wimbledon, London, S.W. 19. 'Phone, 5701, Wimbledon. Telegrams-Fotospeed, London.

Rose, Will R., Ltd., 23, Bridge Street Row, Chester. 'Phone, 10. Telegrams —Wilrose, Chester.

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Ross, Ltd., 13/14, Great Castle Street,
Yebone, V. 1. 'Phone, Oxford Circus, London, W. 1. Langham 2240. Telegrams—Rossano, Wesdo, London; Works, 3, North Side, Clapham Common, London, S.W 4. 'Phone, Macaulay 2472 (2 lines). Telegrams—Rossicaste, Phone, London Rotary Photographic Co., West Dray-ton, Middlesex. 'Phone, West Drayton 357 (2 lines). Telegrams—Rotatoria, West Drayton.

Roth, A. O., 85, Ringstead Road, Cattord, London, S.E 6. 'Phone, Hither Green 2424. Telegrams— Telegrams-Mentorflex, Catgreen, London.

Rowney, George & Co., Ltd., 10-11, Percy Street, London, W. 1. 'Phone, Museum 6220-1. Telegrams--George Rowney, London.

Royal Photographic Society, 35, London, W.C. 1. Phone, Museum 0411.

Phone, Museum vall.

Rudowsky and Rudowsky, 63, Spencer

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Phone, 'Phone, 'P Street, London, E.C. 1. 'Phone, Clerkenwell 8351. Telegrams—Rudossky, Smith, London.

Russell, G. & E., 7, Westminster Road. Coventry.

Sands, Hunter & Co., Ltd., 37, Bedford Street, Strand, London, W.C. 2. 'Phone, Temple Bar 8858-9. Telegrams— Sansunter, Lesquare, London.

Sashalite, Ltd., 28, Victoria Street, London, S.W. 1. 'Phone, Victoria 3018, Telegrams—Sashalite, Victoria 3018, London.

Schering Limited (Volgtlander Dept.), 138-192, High Holborn, London, W.C. 1. 'Phone, Holborn 9345. Telegrams— Scheropha, Phone, London.

Schneider, R. E., 189, The Grove, London, W. 6. 'Phone, Shepherds Bush 5260. Telegrams—Shepherds Bush 5260

School of Commercial and Illustrative Photography (David Charles), Road, Wimbledon, Queen's London, S.W. 19.

School of Pictorial and Technical Photography (John H. Gear), 8, Nottingham Terrace, Regent's Park, London, N.W. 1. 'Phone, Welbeck 2204.

Screnus, Ltd., Brentford, Middlesex. 'Phone, Ealing 2091. Telegrams-Screnus, Brentford.

Scrivens, E. L., & Co., Ltd., 60, Queen's Road, Doncaster. 'Phone 559, Telegrams—Scrivens, Doncaster 559.

Seeing Camera, Ltd., Central House, Upper Woburn Place, London, W.C. 1. 'Phone, Euston 2254.

Seifert, R. O., 46, Farrington Street, London, E.C. 4. 'Phone, Holborn 1167.

Sensitized Fabric Co., Ltd., Bush House, Aldwych, London, W.C. 2. 'Phone, Temple Bar 7376. Telegrams -Sensitex, Bush, London.

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Service Co. (London), Ltd., 289, High
Holborn, London, W.C. 1. Phone,
Holborn 0664 (3 lines). Telegrams—
Admittedly, London.
Sessions, Wrn., Ltd., The Ebor Press,
York. Phone, York 3326. Telegrams—
Sessions, 3326, York.
Sheffield Photo Co., Ltd., 6, Norfolk
Row, Fargate, Sheffield. Phone,
23891. Telegrams—Photo, Sheffield.
Sichel, O., & Co., 122-124, Golden Lane,
London E.C. 1. Phone Clerkenwell

9655 Telegrams-Shiploads, Barb. London.

Simeons, C., & Co., Ltd., 17, Wilson Street, Finsbury, London, E.C. 2. meons, c., London, E.C. z. Street, Finsbury, London, E.C. z. 'Phone, National 2801. Telegrams—'Phone, National 2801. Telegrams—'I won Works, Iellify, Finsquare, London; Works, Iellify, Finsquare, London; Beds. Jellify, Finsquare, London, New Bedford Road, Luton, Beds. New Bedford Road, Luton, Beds. Telegrams— Gelatinous, Luton.

Sinclair, James A., & Co., Ltd., 3, Whitehall, London, S.W. 1. 'Phone, Whitehall 1788. Telegrams-Oraculum.

Parl, London.
Small, Herbert (Proprietary), Ltd., 308-310, Collins Street, Melbourne. C. 1; 243, Pitt Street, Sydney,

Australia. Smith, C., 31, Belle Vue Place, Belle Vue Road, Leeds, 3, Yorks.

Soho, Ltd., 3, Soho Square, London, W. 1. 'Phone, Gerrard 2184 (2 lines). Telegrams-Noiram, Rath, London.

Speedy, D. & P., Ltd., Shelford Place, London, N. 16. 'Phone, Clissold 0696.

Standard Kine Laboratories, Ltd., Portsmouth Road, Thames Ditton. 'Phone, Emberbrook 2350-1. Telegrams -Standard, Thames Ditton. London Office, Eagle House, Jermyn Street, S.W.1.

Standard Photographic Supplies, 15, Leam Terrace, Leamington Spa. 'Phone, Leamington 1518.

Stephens, Henry C., Ltd., 57, Aldersgate Street, London, E.C. 1. 'Phone, Nat. 4833. Telegrams—Inkeent, London. Sugg, William & Co., Ltd., Ranelagh,

Works, Chapter Street, Westminster. London, S.W. 1. 'Phone, Victoria 3211. Telegrams-Sugg, Churton, London.

Sunbeam Tours, Ltd., 37, Bedford Street, Strand, London, W.C. 2. 'Phone, Temple Bar 8858-9. Superglaze Co., 597, Seven Sisters Road, London, N. 15. 'Phone, Stamford

Hill 1879. Symex General Products, Ltd., 117a, Fore Street, London, N. 18. 'Phone,

Fottenham 3873. Telegrams—Rextott, Tottlane.

Synchrophone, Ltd., 24, Berners Street, London, W. 1. 'Phone, Museum 4876. Telegrams—Synchro, Phone, London.

Taylor, Taylor & Hobson, Ltd., Head Office and Works, Leicester. 'Phone, 20134-5. Telegrams-Lenses, Leicester. London Office, 314, Regent Street, W. 1. Phone, Langham 1262. Telegrams— Illiquo, London.

Taylor's Developing and Printing Works, Ltd., Hampden Park, East-bourne. 'Phone, Hampden Park 34.

Tella Co., Ltd., 22, Devonshire Street, Queen Square, London, W.C. 1. 'Phone, Holborn 3708-3709. Telegrams

—Tellurato, Holb, London.
Templeman, J., 15, Percy Street,
Hanley, 'Phone, Hanley 5526 & 4671.
Telegrams—Templeman, Photographer,

Hanley, hames Cine Products Limited, Argus Works, London Road, Ashford, Ashford, Middx. 74 Thames

Thornton-Pickard Manufacturing Co., Ltd., Altrincham. 'Phone, Altrincham 69. Telegrams—Pickard, Altrincham.

Thorsch & Co., Ltd., 37, Bedford Street, Strand, London, W.C. 2. 'Phone, Temple Bar 8858-9. Telegrams -Kawee, Lesquare, London.

Toone, A. S., & Sons, Dulwich Road Mills, Nottingham. 'Phone, Notting-ham 75570. Telegrams—Permanent,

Nottingham.

Topical Press Agency, Ltd., 10 and 11, Red Lion Court, Fleet Street, London, E.C. 4. 'Phone, Central 8982-4. Telegrams—Topicality, Fleet, London.
Trapp, L., & Co., 61, Goldney Road, Paddington, London, W.9. 'Phone,

Abercorn 2096.

Tripofio Company, 135, King Street, Aberdeen, Scotland.

Turner, A. R., 50, Sydenham Park, London, S.E. 26.

Typary & Typon Co., Ltd., 1-4, Red Lion Passage, Fleet Street, London, E.C. 4. 'Phone, Central 1376. Tele-grams—Typantypo, Fleet, London, Littled Photographers, 14-70.

United Photographers, Ltd., 72, Miles Street, Liverpool, 8. 'Phone, Royal 956. Universal Button Co., 13, Surat Street, London, E. 2. 'Phone, Advance 2254. Telegrams—Unibutco, Beth, London.

Vacuum Drier & Chemical Equipment Co., Ltd., 66, Victoria Street, London, S.W. 1. 'Phone, Victoria 9951.

Vandyck Printers, Ltd., Works—Park Row, Bristol. 'Phone, 23567. Tele-grams—Vandyck, Bristol; Sales Office —Imperial Buildings, Kingsway, Lon-don, W.C. 2. 'Phone, Holborn 4567. Telegrams—Dureresque, Phone, London.

Vanguard Manufacturing Co., Maidenhead, Berks. Telegrams—Vanguard head, Berks. Co., Maidenhead.

Vickery Bros., Photographic Works.

Paignton. Phone 5129.

Vinten, W., Ltd., 106, Wardour Street, London, W.1. Phone, Gerrard 4792.

V.I.S. Projectors, 168a, Battersea Bridge Road, London, S.W. 11. 'Phone, Battersea 0846. Telegrams-Filmslides.

Batt, London. Walter, D., & Co., Ltd., 61-63, Lant Street, London, S.E. 1. 'Phone, Hop

Watson, W., & Sons, Ltd., 313, High Holborn, London, W.C. 1. 'Phone, Holborn 2767. Telegrams—Optics, Holb, London. Works, Bell's Hill,

High Barnet, Herts.

Watson & Sons (Electro-Medical),
Ltd., Sunic House, Parker Street,
Kingsway London, W.C. 2. 'Phone,

Holborn 3881.

Watts, Matthias & Co., Ltd., Moseley Village, Birmingham. 'Phone, South Village, Birmingham. 'Phone, South 0848. Telegrams—Repousee, Birming-0848.

Wellington & Ward, Ltd., Ilford, London. 'Phone, Ilford 3000 (20 lines). Telegrams—Wellington, Ilford.

Wenban, A. G., 19, Bartlett's Buildings, Holborn Circus, London, E.C. 4. 'Phone, Central 3166.

Western Electric Co., Ltd., Bush House, Aldwych, London, V Temple Bar 1001. W.C. 2. Telegrams-Westelcol, London.

Westminster Engineering Co., Ltd., Victoria Road, Willesden Junction, London, N.W. 10. 'Phone, Willesden 1700. Telegrams—Regency, Phone, London.

Westminster Photographic Exchange Ltd., 119, Victoria Street, London, S.W. 1. 'Phone and Telegrams-Vic-S.W. 1. Phone and Telegrams—Victoria 0669; also 111, Oxford Street, London, W. 1. 'Phone and Telegrams—Gerrard 1432; 24, Charing Cross Road, London, W.C. 2. 'Phone and Telegrams—Temple Bar 7165, and 81, Strand, W.C. 2. 'Phone and Telegrams

—Temple Bar 2710.

Weston Electrical Instrument Co.,
Ltd., Kingston By-Pass, Surbiton,
Surrey. 'Phone, Elmbridge 6400-6401.

Telegrams—Pivoted, Surbiton.
Wheeler, Geo., & Co., Acorn Press,
Charles Street, Manchester. 'Phone,

Ardwick 3968.

Whitehouse, Willetts & Bennion, Ltd., Rex Works, Tything, Worcester. 'Phone, Worcester 288. Telegrams— Frames, Worcester. London Office, St. Stephens House, 2, Coleman Street, E.C. 2. 'Phone, Metropolitan 7662. Wiggins, Teape & Alex, Pirle (Sales), Ltd... Glory Mill. Wooburn Green.

Ltd., Glory Mill, Wooburn Green, Bucks. 'Phone, Bourne End 195-196.

Telegrams—Teape, Wooburn Green.
Wilkinson & Co., 15, Holmeside, Sunderland. 'Phone 3021. Telegrams— Sunderland 3021.

Wilkinson, J., & A., 6, St. Oswald Street, Manchester, 9. 'Phone, Colly-

hurst 1475. Telegrams-Jayna, Manchester. Williamson Manufacturing Co., Ltd., Litchfield Gardens, Willesden Green, London, N.W. 10. 'Phone, Willesden 0073, 0074. Telegrams—Kinetogram, Willroad, London. Winsor & Newton Ltd., 37/40, Rath-bone Place, Oxford, Street, London.

winsor & Newton Litt., 37/10, Kambone Place, Oxford Street, London, W. 1. 'Phone, Museum 7624 (5 lines). Telegrams—Sepia, Rath, London. Woolley, J., Sons, & Co., Ltd., Victoria Bridge, Manchester. 'Phone, Blackfriars 2323. Telegrams—Phar macy, Manchester.

Wray, Ltd., Optical Works, Ashgrove Road, Bromley, Kent. 'Phone, Ravensbourne 1729.

Xpdo, Ltd., Didcot, Berks. 'Phone, Didcot 25. Telegrams—Xpdo, Didcot. York & Son, York House, 3, Emperor's Gate, Gloucester Road, South Kensington, London, S.W. 7. 'Phone, Western 4980

Zeiss, Carl (London), Ltd., Mortimer House, 37-41, Mortimer Street, London, W. 1. 'Phone, Museum 9031 (6 lines).

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Zelss Ikon, Ltd., Mortimer House, 37-41,
Mortimer Street, London, W.1. 'Phone,
Museum 9031. Telegrams—Zeissikona.
Zinco Collotype Co., Macdonald Road,
Edinburgh. 'Phone, Central 26377.

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